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SAVING STURGEON IN THE GREAT LAKES

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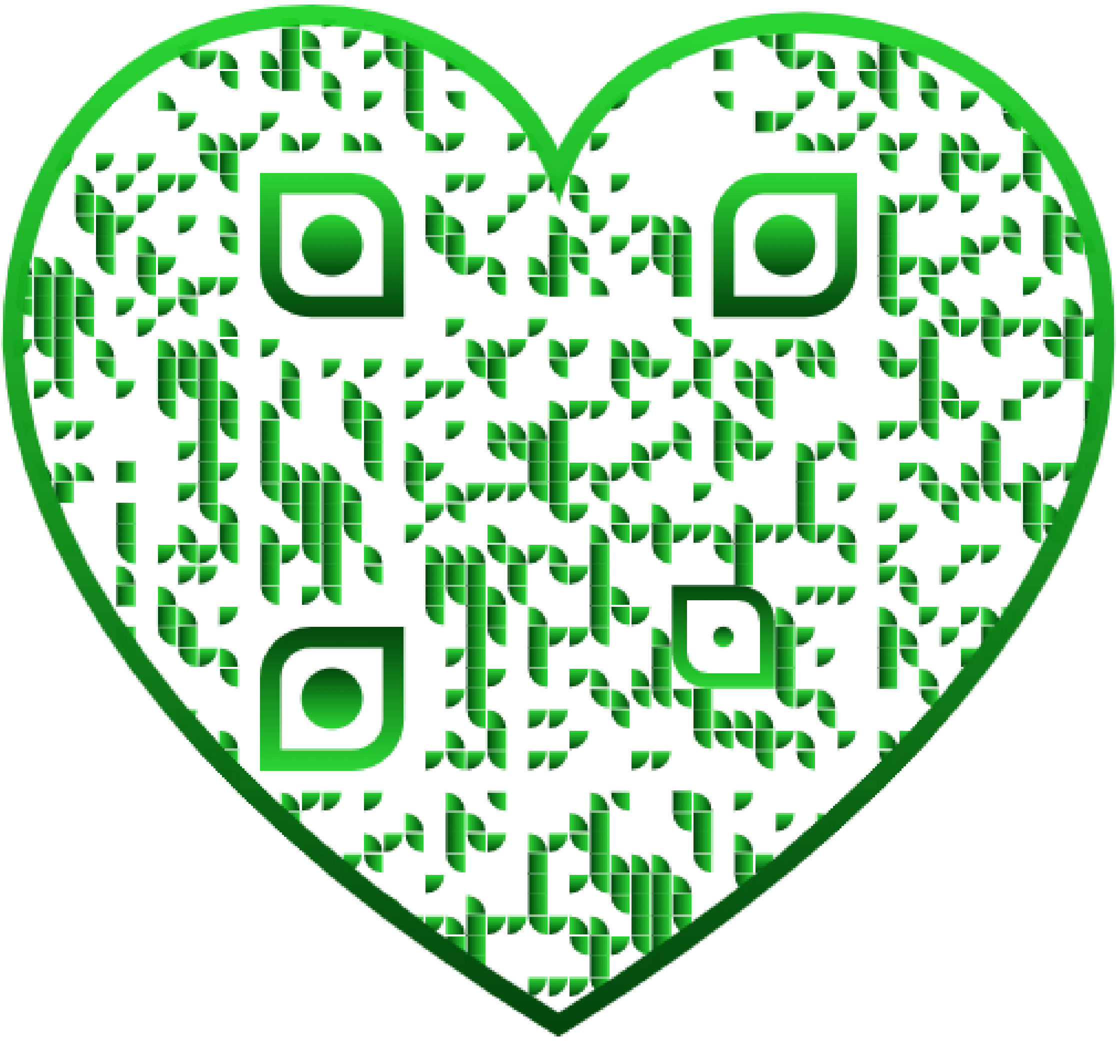

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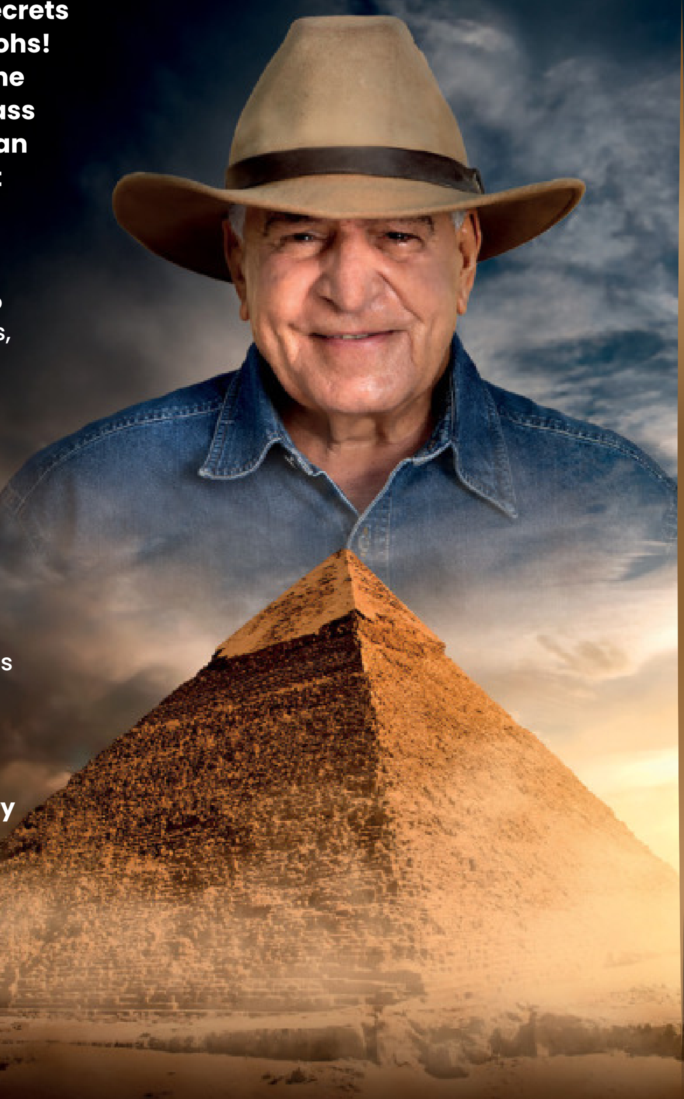

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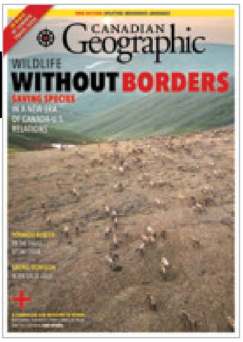

Wildlife photographer Peter Mather captured this image of Porcupine caribou near the Yukon-Alaska border.

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Travel
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COVER: PETER MATHER. FROM TOP: MATT MELNYK; CHRISTIAN FLEURY/CAN GEO; JEAN-CHRISTOPHE LEMAY; DAVID HUTCHISON/ISTOCK

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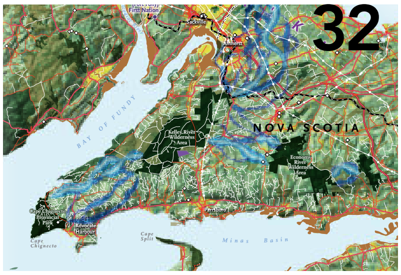

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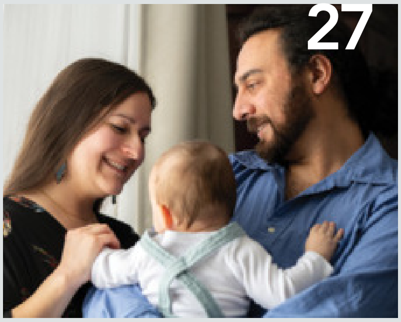

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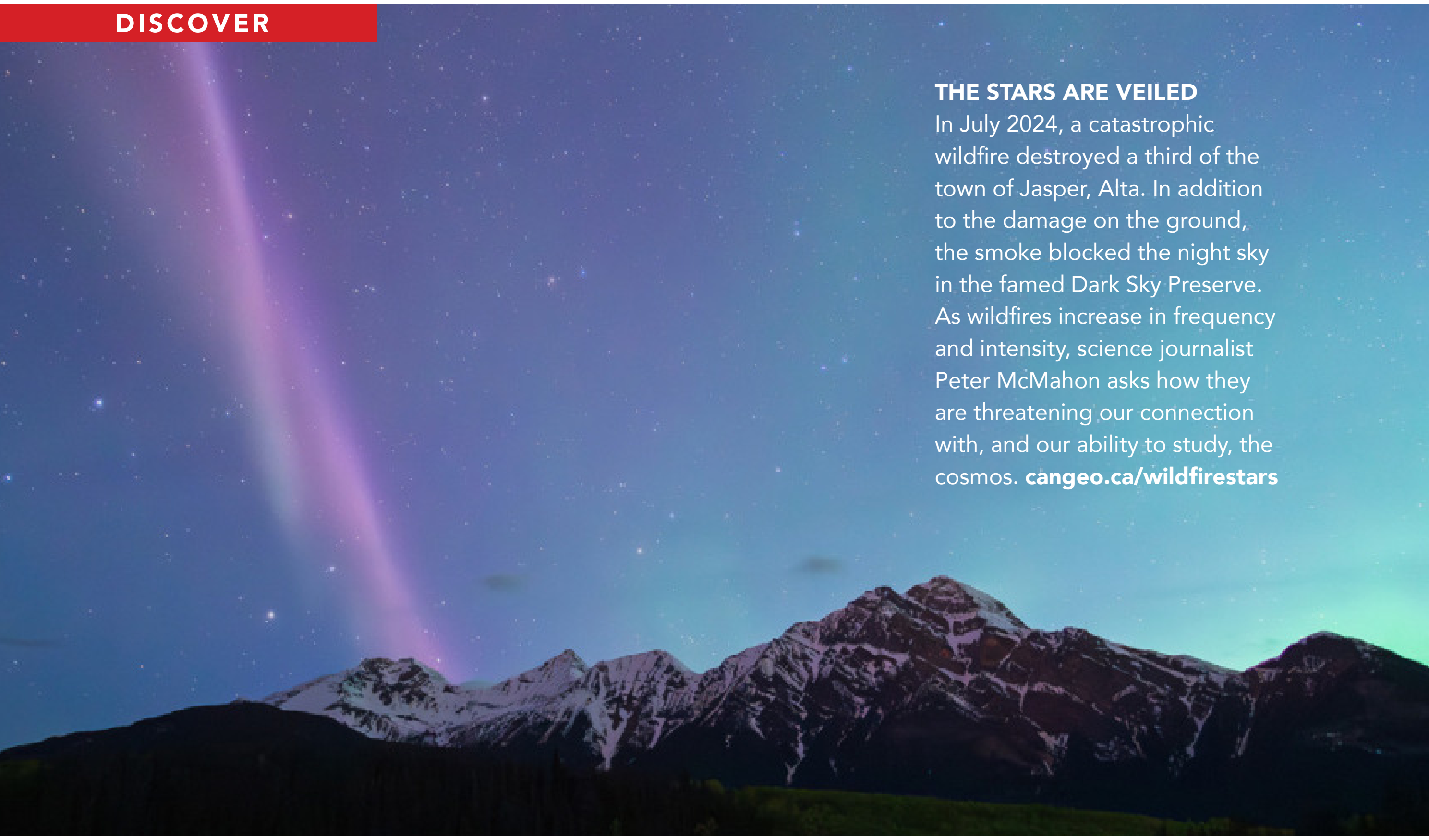
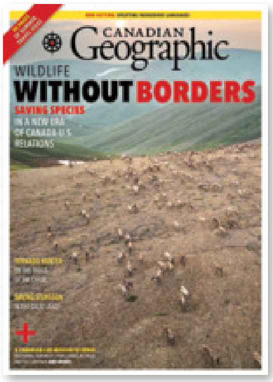
DISCOVER



THE STARS ARE VEILED

In July 2024, a catastrophic wildfire destroyed a third of the town of Jasper, Alta. In addition to the damage on the ground, the smoke blocked the night sky in the famed Dark Sky Preserve. As wildfires increase in frequency and intensity, science journalist Peter McMahon asks how they are threatening our connection with, and our ability to study, the cosmos. **cangeo.ca/wildfirestars**

COVER STORY



WITHOUT BORDERS

As work on this issue was underway, the U.S. president began gutting American federal agencies responsible for everything from international development to wildlife and the environment. We quickly pivoted to include a feature story about the potential impact on cross-border wildlife conservation and chose a new cover: the Porcupine caribou herd near the Yukon-Alaska border during their staggering 250,000-kilometre migration.

CORRECTION (MARCH/APRIL 2025)

In "Canadian Photos of the Year 2024," the bear on page 70 is a cinnamon-coloured black bear, not a grizzly bear.

PHOTOGRAPHY CLIMATE NEWS TRAVEL WILDLIFE CULTURE

Canadian Geographic Newsletters

CANGEO.CA/NEWSLETTERS

CANADA FILES

"What does being Canadian mean to you?" That's the question broadcast journalist Valerie Pringle would ask her guests at the end of each interview for *Canada Files*, a TV series that featured interviews with remarkable Canadians on their lives, how they see the world, the choices they made and the lessons they learned. Although the responses to this question were personal, they reflect the themes and ideas of Canada — a sentiment especially thought-provoking at this time for the country. Read the responses at **cangeo.ca/canadafiles**

EXPLORE

JOURNEY OF RESILIENCE

Award-winning photographer and explorer Jillian Brown has an epic list of adventures to her name. But beyond paddling across the continental U.S., Brown is also a strong and vocal advocate for those suffering from PTSD, promoting the importance of connecting to nature as a tool for healing. Listen to her tale of survival with host David McGuffin. **cangeo.ca/jillianbrown**

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OPPOSITE: DEVIN SHAW. COVER: PETER MATHER; THIS PAGE, FROM TOP: STACEY_NEWMAN/ISTOCK; COURTESY JILLIAN BROWN

Four-year-old Marcus, right, chases a friend through a field outside Ottawa under smoky skies in summer 2024.

ALEXANDRA POPE

NURTURING HOPE

MY SON Marcus is obsessed with natural disasters. He loves to watch documentaries about tornadoes and tsunamis and can tell you the exact sequence of events that led to the destruction of Pompeii in 79 AD. Lately he's begun telling me what he would do to survive such a catastrophe, with all the swashbuckling confidence of a four-year-old who's never known real danger.

His most recent declaration of invincibility, inspired by images of the wildfires in Los Angeles, sent me into a private spiral of worry and sadness. Because while his life has been mercifully cataclysm-free, he is growing up in a very different world than the one I knew as a child. This fact would be easier to accept if I consistently believed — as my parents did — that we're heading toward a better future.

That's not to say I've lost hope. Good people are out there doing what they can to steward their portion of our singular planet; you'll meet some of them in this issue. Transboundary conservation efforts, including those focused on restoring sturgeon populations in the Great Lakes (page 60), will hopefully continue in spite of U.S. President Donald Trump's sweeping cuts to federally-funded science (page 34). For my part, I've doubled down on my personal commitment to buying less and to growing and making more. But it's important to recognize that ecological grief is real and valid, and it's healthy — *vital* — to talk about it.

We debated whether to run Laurie Sarkadi's personal essay on climate anxiety (page 42) in print — is it too depressing? — but ultimately decided the time is right to initiate these difficult but necessary discussions. And I think you'll find that Sarkadi's story doesn't dwell in the darkness but rather encourages us to move through it and find a way to carry on.

Now, more than ever, we all need reasons to hope, so tell me: what are yours?

—Alexandra Pope

To comment, please email editor@canadiangeographic.ca or visit cangeo.ca.

For inside details on the magazine, follow editor Alexandra Pope on Bluesky (@xelaepop.bsky.social) and Instagram (@xela.explores).

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BIG PICTURE

Celebrating Canada's Grandeur

PHOTO BY **KATHRYN PEIMAN**
A pollen-dusted honeybee approaches a sunflower at the height of summer at Bragg Farms near Bowmanville, Ont. Often confused with native bees, such as the sweat bee or miner bee, honeybees were introduced by Europeans in the early 1600s. While farmed honeybees produce honey and beeswax, they can negatively impact native bee species, outcompeting them for food (while not being as effective pollinators) and spreading diseases to which native bees have no immunity.

Enter your best shots to the 2025 Canadian Wildlife Photography of the Year competition at cwpy25.canadiangeographic.ca.

EXPOSURE

Showcasing our photo community

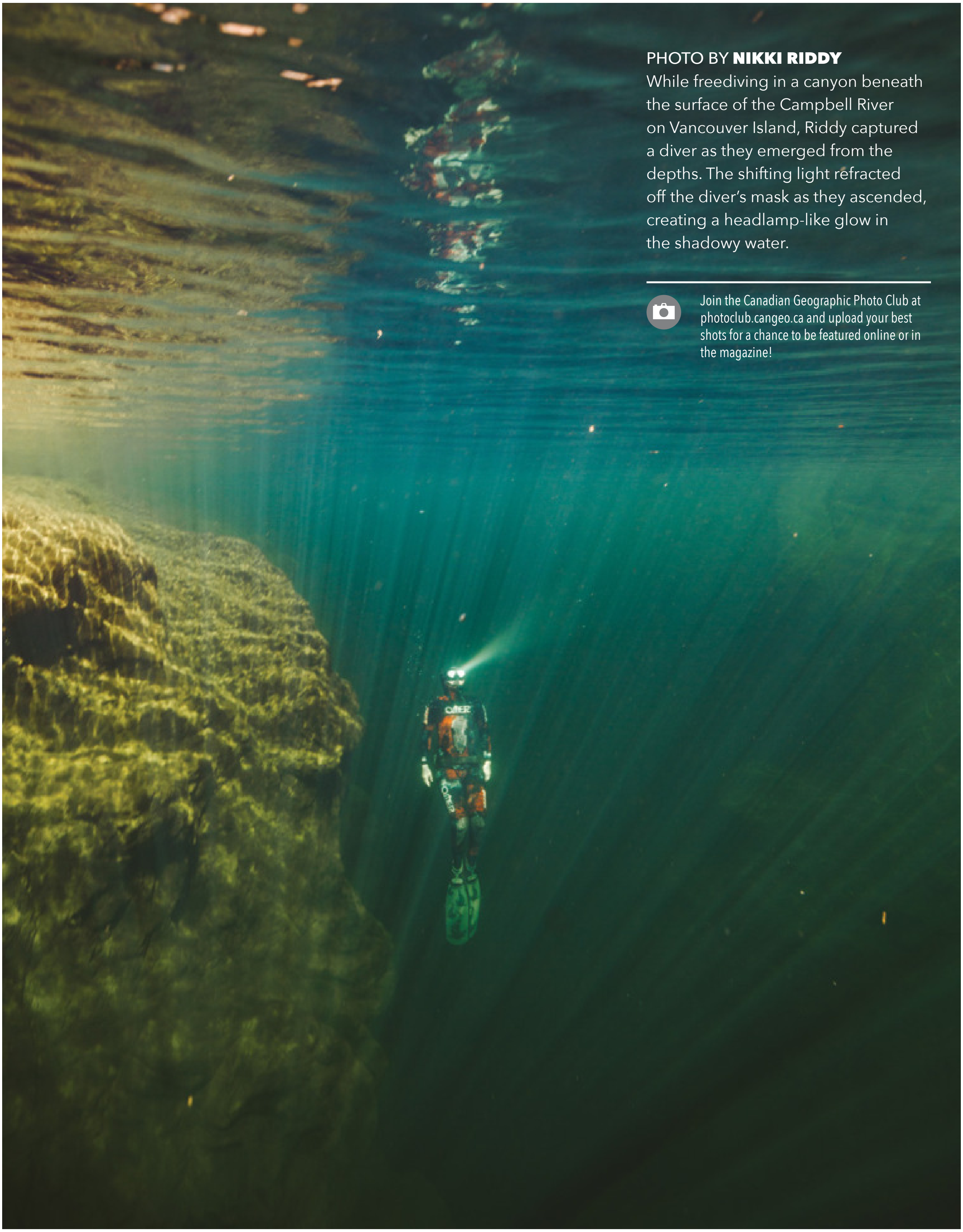


PHOTO BY **NIKKI RIDDY**
While freediving in a canyon beneath the surface of the Campbell River on Vancouver Island, Riddy captured a diver as they emerged from the depths. The shifting light refracted off the diver's mask as they ascended, creating a headlamp-like glow in the shadowy water.

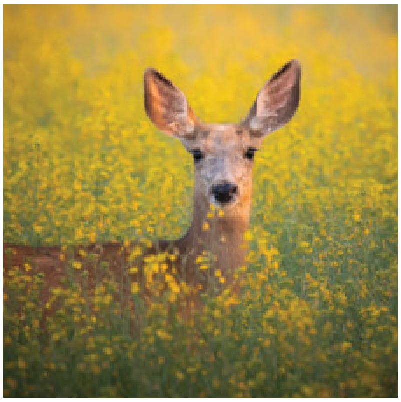
Join the Canadian Geographic Photo Club at photoclub.cangeo.ca and upload your best shots for a chance to be featured online or in the magazine!

IN A SNAP

Sharing Can Geo via Instagram

@that.butterfly.girl **Kirstyn Eckhardt**
Dorcas copper (*Tharsalea dorcas*) on shrubby cinquefoil, Interlake Region, Man.

@iizunadesign **Momoe Toyama**
Bighorn rams, Abraham Lake, Alta.



@lyndonswildphotos **Lyndon Norman**
Mule deer in a canola field near Stettler, Alta.

@robichaud.jpg **Brandon Robichaud**
Lighthouse at Peggy's Cove, N.S.

@maggieparise **Maggie Parisé**
Red fox at sunrise, St. John's, N.L.

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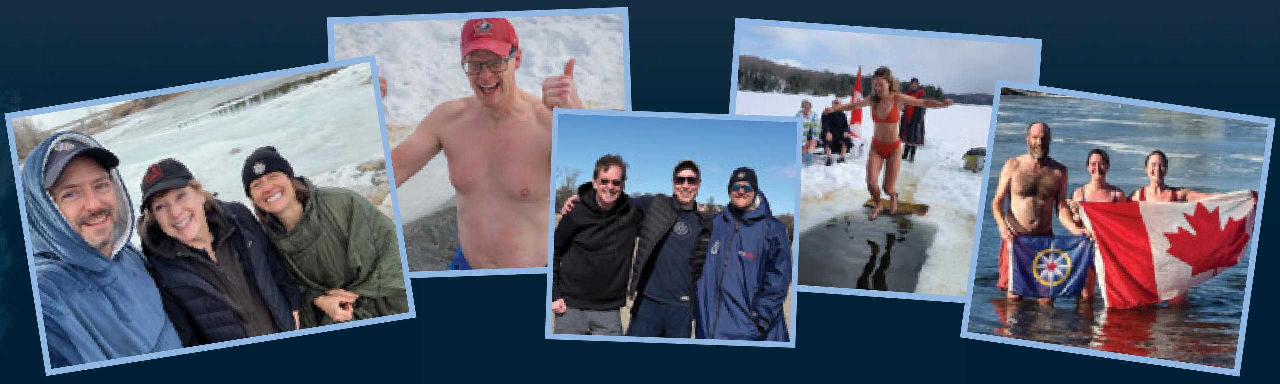
#CANGEOPOLARPLUNGE

DUCIT AMOR PATRIÆ

BE BOLD. Go Cold.

The Royal Canadian Geographical Society is proud to announce that the 2025 Can Geo Polar Plunge was a remarkable success, raising critical funds in support of *Canadian Geographic* and the *Explore* Podcast.



Thank you to our plungers who dared to **"Be Bold, Go Cold"** and braved the frigid waters of local lakes and rivers across Canada in support of our mission to make Canada better known to Canadians and to the world.

The Polar Plunge would not have been possible without the generous support of our donors. In particular, we would like to thank:

Dr. Mark Terry, FRCGS; Dr. Ian Hammond, FRCGS; Jillian Brown, Lynne Evenson, and Dr. Zac Robinson, FRCGS.

ROYAL CANADIAN GEOGRAPHICAL SOCIETY

CANADIAN Geographic

Weaver says to stop climate warming, we must capture and store carbon permanently.

DEREK FORD

Andrew Weaver

The climate scientist on why the world urgently needs to rethink its definition of "net zero"

INTERVIEW BY **ALEXANDRA POPE**

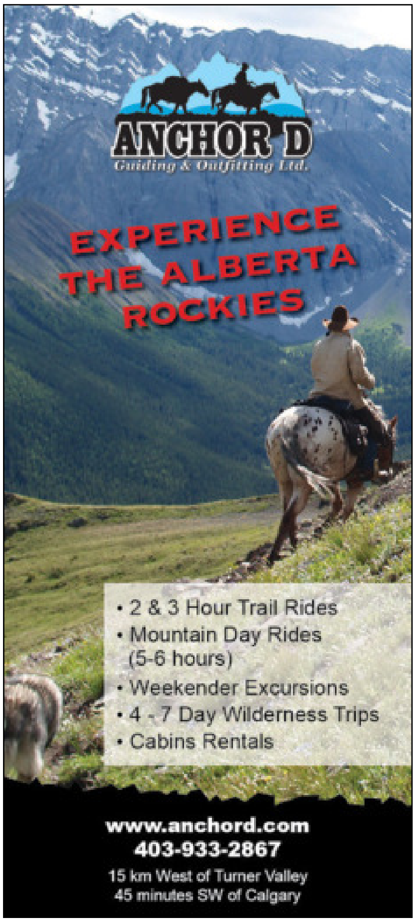
Planting trees alone won't stop global warming, and nature-based climate solutions are not a licence to keep emitting. That's the underlying message of a paper published last fall in *Nature* by a multinational group of climate scientists, including Andrew Weaver, a professor in the School of Earth and Ocean Sciences at the University of Victoria and former leader of the B.C. Green Party. Increasingly, Weaver says, fossil fuel companies and major polluters are buying carbon credits to offset their greenhouse gas emissions — but this reflects a flawed understanding of what it will take to achieve net-zero emissions and halt runaway warming. Weaver discusses the backwards logic of offsets, the need to transition away from fossil fuels and why climate change is an opportunity for innovation.

On nature-based carbon offsets

[Nature-based climate solutions and carbon offsets] distract from what we know is the problem: the emission of greenhouse gases into the atmosphere. They go up, and we need them to come down. The best thing to do is stop letting them go up in the first place. But we also have to get them down — permanently, not attached to a tree. Claiming "I'm not going to cut down that tree over there if you give me money" is not a carbon offset. It's like me saying to you, "Please give me $10,000; otherwise, I'm going to go to my car dealer and buy a big, gas-guzzling SUV." It's just silly.

On "geological net zero"

The problem with our current understanding of net zero is that it doesn't reflect the timescales involved. When we burn fossil carbon, in essence what we're doing is taking ancient forests that died and became coal over tens of millions of years — at high pressures deep under the Earth's surface — and we're putting that up in the atmosphere in just a few decades and expecting a tree to grow and somehow be an offset. A tree lives for 100 years and then dies and gives the carbon back to the atmosphere. That's why we refer to *geological net zero*. It means that emissions from fossil fuels must be balanced by carbon that is permanently sequestered in geological reserves, whether it be through carbon capture and storage or direct air capture and storage.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On multilateral climate agreements

As far as I can tell, the net outcome of COP29 [the most recent United Nations climate conference, held in November 2024] was a spike in greenhouse gas emissions as thousands of people flew from all corners of the world to descend on Azerbaijan, a petrostate, to have a holiday, because nothing of substance was accomplished there. It was a complete and utter embarrassment. It was an abdication of responsibility by our elected leaders. This is wasting everyone's efforts because they spend all their time trying to figure out ways of gaming the system so as to not actually reduce fossil fuel emissions. I think, frankly, the scientific community and NGOs should boycott these, because they have become a joke.

On an immediate energy transition

Rather than spending all our time trying to game the system with carbon offsets, far better would be to decarbonize energy systems now and go all in on negative emissions technologies. I can't tell you how many millions of dollars I see being spent on research and development in terms of nature-based climate solutions because that's simple: plant some trees and away you go. These are kick-the-can-down-the-road policies that make you think you're doing something. I'd like us to keep planting trees, too, but the real issue here is what are we doing with the expansion of oilsands extraction? What are we doing with the expansion of liquefied natural gas? What are we doing approving offshore exploration in the Atlantic Ocean? International leaders have really not taken this problem seriously. And the reason why is that it doesn't manifest itself right away. Those making the decisions today won't actually have to live the consequences of the decisions they did or did not make.

The Carbon Engineering innovation centre in Squamish, B.C., helps to develop direct air carbon capture technology.

DAVID BUZZARD/ALAMY STOCK PHOTO

On planting trees

There is a role for nature-based carbon solutions, but it's not to offset future greenhouse gas emissions. About one third of the human-produced carbon in the atmosphere has come from deforestation, so there is something to be said for protecting our existing biosphere and reforesting areas that have historically been deforested. Nature-based solutions are also important for climate adaptation. For example, we know that planting trees in cities is great for cooling and for absorbing water rather than letting it run off in our storm sewer systems. The danger is that governments and industry love these solutions because it means you don't have to change the status quo.

On reasons to hope

It's really empowering for individuals if they recognize that global warming is not something to be feared: it's something to be embraced as a catalyst for innovation, because that's what leads to prosperity. Prosperity happens when you pivot on a dime. You can see climate change and, frankly, any other environmental problem through a lens of hopelessness and despair, or this lens which says, "what an incredible opportunity for innovation; how can we in our jurisdiction strategically take advantage of this opportunity for the betterment of our collective and the global collective?" ⊛

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Plover comeback

IN 2024, KOUCHIBOUGUAC NATIONAL PARK, N.B., had its best piping plover baby boom in seven years, with 16 fluffy chicks born to the park's six nesting pairs. The nesting rate of 2.67 fledglings per pair was a major win for the endangered species after a devastating crash in 2019 that saw nesting rates in the park drop to 0.5. It's just one step in a long journey that started with a federal recovery strategy in 2012, and ecologists are still concerned about beach development, loose dogs and off-road vehicle collisions. The plovers will continue to need help rebuilding their population, such as by closing sections of the national park during the breeding season and encouraging beach cleanups throughout their range.

76 CENTIMETRES

THAT'S THE LENGTH of a Kemp's ridley sea turtle — the smallest and most endangered sea turtle species — that made an unexpected appearance on the shores of Quebec's Îles-de-la-Madeleine in December. This unprecedented finding suggests the turtle, which usually ranges between the Gulf of Mexico and New England, was lured farther north by the climate change-warmed waters of the Gulf of St. Lawrence. While the turtle didn't survive, its discovery highlights Canada's growing role in sea turtle protection.

RESILIENT ROOTS

TEMPERATE FORESTS may be more resilient to climate change than we thought, suggests research from the University of New Hampshire. Rising temperatures and increased atmospheric nitrogen due to pollution are thought to cause carbon loss in forests. But these two stressors can stimulate plant growth and activity, adding more carbon to the soil and keeping carbon levels stable. Myrna Simpson of the University of Toronto Scarborough, who collaborated on the research, believes more data is needed due to the complex nature of climate change's impacts on ecosystems.

Read *Canadian Geographic*'s latest wildlife stories at cangeo.ca/wildlife.

Chum couture

SALMON HATS ARE BACK IN STYLE for orcas! This très chic trend was first observed in 1987 when a female orca was spotted with a salmon on her head; the rest of her pod soon donned the salmon corpse chapeau, à la mode. The behaviour mysteriously disappeared a year later. But fashion is cyclical, and in late 2024, orcas in Puget Sound were spotted sporting the chum couture once again. Scientists hypothesize that an abundance of chum salmon may be behind the trend — perhaps it's a way to save a snack for later. Or, maybe, salmon hats really are a fashion statement in the underwater world — and these whales are dressed to kill.

"the margins of the *ice*"

AN ANCIENT WHITEBARK PINE FOREST, hidden for millennia under ice in Wyoming's Rocky Mountains, has been discovered due to melting ice caused by rising temperatures. The trees, dating back nearly 6,000 years, were found at an elevation 180 metres higher than today's treeline. "We were really surprised to find a forest was emerging from the margins of the ice," says Montana State University professor Cathy Whitlock. While the discovery offers a glimpse into the past, it also serves as a stark reminder of climate change's impact.

OPPOSITE: DON WHITE/ISTOCK. THIS PAGE, CLOCKWISE FROM TOP: NATIONAL PARK SERVICE/WIKIMEDIA, DAVID HUTCHISON/ISTOCK, DANIEL STAHLE, DAVE COLES/ISTOCK

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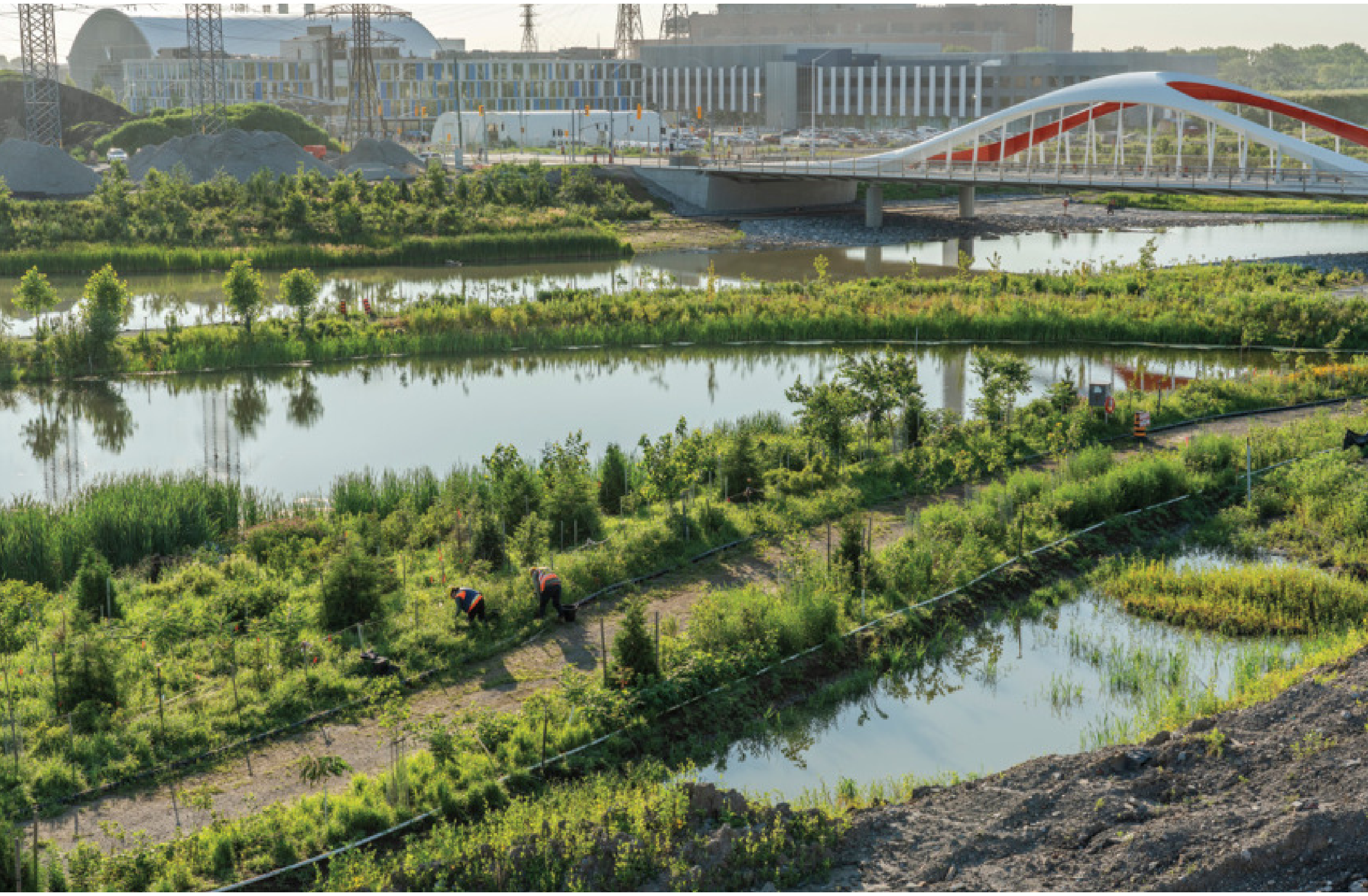
Wasteland to wetland

An ambitious flood prevention project in Toronto's Port Lands reconnects waterways and people

BY **BRIAN BANKS**



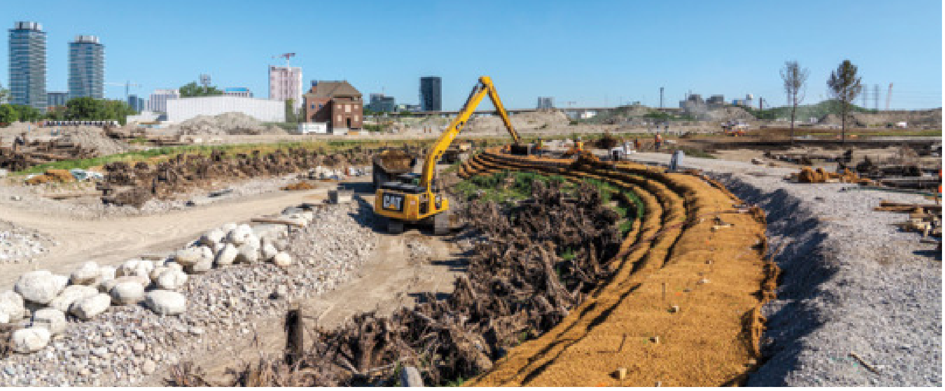
SHANNON BAKER STOPS mid-sentence and points. "There's a red-tailed hawk," she says.

We watch the raptor cross low over the slow-moving river 50 metres to our left. It lands briefly in the thin, autumn-hued cover of bushes, plant stalks and sparse trees on the north bank, then lifts off again. "There he goes," she says. "Hunting."

Baker is a landscape architect and a director at Waterfront Toronto, the government corporation leading a multi-decade revitalization of swaths of aging, underused and derelict shorefront properties on the eastern edge of the city's downtown core. Most days, she works in an office. But this late November morning, we're touring the site of the project that's been her focus for the last eight years — one of the most ambitious urban nature restoration schemes undertaken anywhere.

Red-tailed hawks are common in the city. What makes this one notable is it's hunting in an area that for the last 100 years was a flat, infertile, toxic expanse of parking lots, factories, warehouses, marine terminals, wharves, oil tank farms and other industrial buildings. Yet today, a vibrant river valley runs through it.

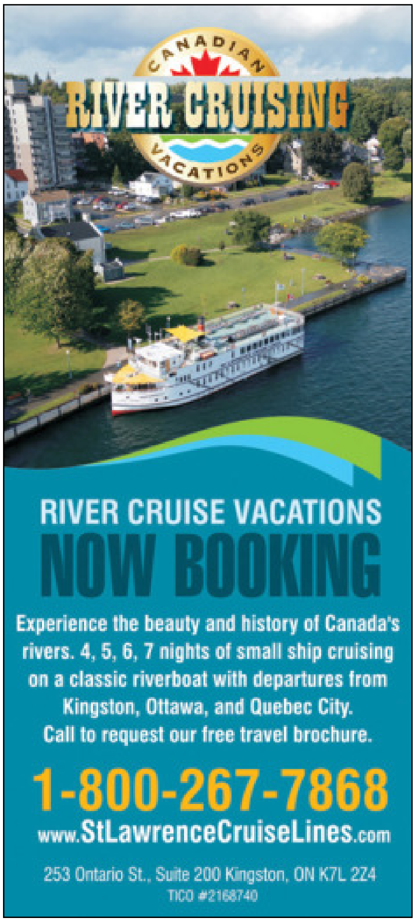
That river is a 1.3-kilometre extension of the Don River, one of the primary Lake Ontario tributaries around



The restoration work at the port lands in summer 2024 (PREVIOUS). Shoring up the walls of the new river channel (LEFT).

which the city was built. Throughout Toronto’s early history, the Don emptied into the Ashbridges Bay marsh, one of the largest wetlands on the lake. But in the late 1800s, a concrete corridor called the Keating Channel was built on the marsh’s northern edge. Soon, the river was redirected into it — a new routing with a 90-degree right turn leading into the lake — while its original outlets and hundreds of hectares of marsh were filled in to create land for a new port district.

In economic terms, the new river and adjoining wetlands are a $1.3-billion flood prevention project. A century of hardening and distorting the Don’s natural channel meant it often spilled its banks. In that state, Baker says, the almost 300 hectares of surrounding port lands property — land that’s now earmarked for new housing and other mixed-use redevelopment — risked inundation in heavy storms.



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The scale of the effort to solve that issue by creating a new, ecologically robust river channel has been immense: six-plus years of construction; roads lifted and moved, and multiple bridges installed; 1.4 million cubic metres of contaminated soil excavated, treated and reused or replaced; a water-tight concrete-and-steel wall driven down to bedrock around the entire system to keep out remaining toxins in perpetuity. Plus, two million herbaceous plants, 77,000 shrubs and 5,000 trees were planted to establish a true array of native aquatic, wetland and forest habitats, while fabricated interlocking tree roots, soil lifts and other bioengineered materials were embedded to stabilize the channel walls and establish a mature landscape right out of the box.

That said, the benefits don’t stop at flood control and ecological restoration. “For me, the project has always been about reconnection,” says Baker. “We’re reconnecting the river to the lake, but in this process, we’ve had so many opportunities to reconnect people. There’ll be a massive park space and over a kilometre of new river valley for them to explore, to be in connection with nature, right in downtown.”

Perhaps the deepest reconnections are with local Indigenous communities, whose settlements and trade routes on the Don and other rivers in the area predate the city’s creation by millennia.

Even before construction started, Waterfront Toronto engaged the Mino Kamik Collective, an Indigenous engagement and environmental design consultancy, and one of its leaders, Elder Shelley Charles, from the Chippewas of Georgina Island First Nation, to provide input and coordinate wider Indigenous participation. Charles brought together an Indigenous Advisory Circle made up of Elders, youth, knowledge keepers and language speakers from different local Indigenous communities, which had responsibility for naming the new park as well as the new island created from land now encircled by the new river and the old Keating Channel. It unveiled its choices in a recent ceremony, naming the island Ookwemin Minising, which means “place of the black cherry trees” in Anishinaabemowin/Ojibwemowin, and the park Biidaasige Park, meaning “sunlight shining towards us.” Indigenous design elements, such as a shade structure, fire holder, marker trees and sculpture, will be featured when work on the park is completed this year.

Charles and some of her colleagues also collaborated on the Indigenous planting palette for the site. “We were looking at wetland plants and what would help stabilize the riverbank; also plants that would have relationships with animals and what those connections are,” says Charles.

The plantings included an unplanned bonus: during excavation, seeds from rushes that had lain dormant in the original marsh soil under seven metres of fill for a century started to sprout. Some were saved and later replanted. “It wasn’t a surprise to us when they hit that original soil that there were relatives and seeds,” says Charles. When those first plants started to grow, she says, "it was like, ‘Oh, you found us. We’ve been waiting for you.’”

PREVIOUS AND THIS PAGE: COURTESY WATERFRONT TORONTO

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D'oh Canada

TV's longest running sitcom, *The Simpsons*, has roots buried deep in rural Saskatchewan

BY **SHANE FRASER**

IRONICALLY, it's one story *The Simpsons* hasn't told. Thirty-six seasons, 783 episodes and counting, but none with Homer in Saskatchewan. Sure, Sask has been referenced in the series ("you'll get enough drugs to make Regina look like Saskatoon"). And *The Simpsons Movie* resonates more when you know what scared the *real* Homer's family northward in 1918. But it's mere coincidence. Without Saskatchewan, however, there might not be Homer, Marge, Bart, Lisa or Maggie. The Land of Living Skies sowed the seeds for the longest-living TV sitcom.

It all started with 24-year-old Abram "Abe" Groening, grandfather of *The Simpsons* creator Matt Groening. With the First World War draft underway, Abe sought exemption due to his farm, family and familial Mennonite pacifism. The draft board determined that Abe's farm near Hillsboro, Kansas, was "of very little importance" and his marriage to fellow Mennonite Elisabeth Nickel was "for the purpose of evading military service." He was ordered to report for duty.

Abe refused, which, according to Hillsboro lore, roused vigilantes. Anticipating an attack like that done to other Mennonite "slackers," Abe hid with his family in brother-in-law John Siebert's home while an armed mob circled. After the mob left, locals claim, the Groenings fled north.

Tipped off about Abe's desertion, Agent Roy Pickford of the Bureau of Investigation (pre-FBI) journeyed to Hillsboro on September 15, 1918. He interrogated Siebert.

"I want you to tell me what reason he gave for going to Canada," began Pickford, as recorded in Groening's file. "Mr. Siebert, I want you to come right out and tell me frankly…"

"He wanted to be farming there in Canada."

Pickford pressed. "He told you he didn't want to go to war, didn't he?"

"No, he didn't tell anything about that to me."

Less restrained was George Hagan. An acquaintance of the family, Hagan told the agent that Abe's father Abraham had mentioned saving not Abe but his younger sons from the draft: "If we can get out of it, why not?"

Hagan also revealed that Abraham had met with a Canadian immigration agent in Kansas City. And one of Canada's "high government officers" gave Abraham a card that would "let the boys into Canada without any trouble."

Canada was desperate to replace farmers lost to war with agriculturally adept Mennonites. The immigration agent had advertised free 160-acre Western Canadian farms and distributed a letter declaring "a Mennonite coming to this country now would be exempt from military service."

The Groenings entered Saskatchewan over multiple trips from August to September 1918 after selling their land and goods for a reported $150,000. They settled in the Mennonite-friendly town of Herbert, Sask., but later farmed about 25 kilometres north around Main Centre, a hamlet below the South Saskatchewan River.

America called on the North-West Mounted Police to find Abe and American Consul J.H. Johnson to bring him to justice. Claiming influenza, the latter was unsuccessful.

Safe near Main Centre, Abe and Elisabeth bore their only Canadian child Homer Philip Groening on Dec. 30, 1919.

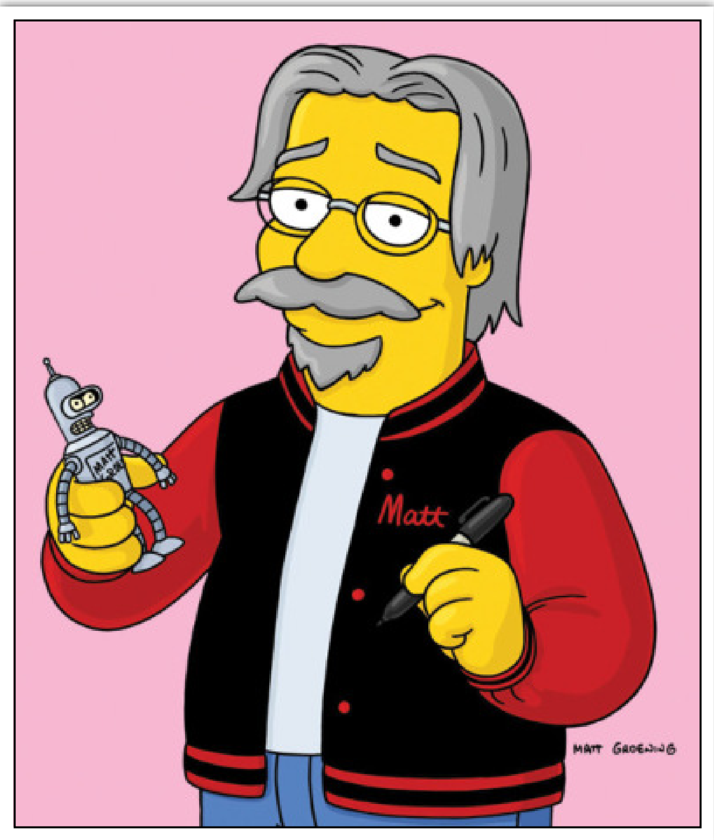
Homer's Canucking was brief. The war had ended — as had support for Mennonites. They were considered pests who had invaded Canadian farms while true Canadians were sacrificed overseas. In 1920, the Groenings returned to Kansas. Only Homer's uncle Frank stayed behind with his new bride. They had two of Homer's cousins in Saskatchewan.

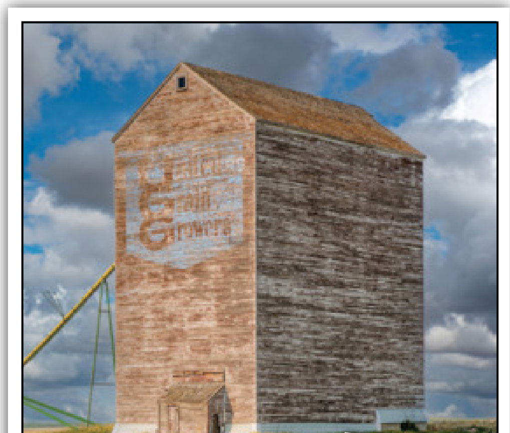
America hadn't forgiven Abe, on whom it placed a $50 bounty. Evading even more punishment, Abe became a professor who remained married to Elisabeth until her death in 1975. He succumbed six years later in Portland, Oregon.

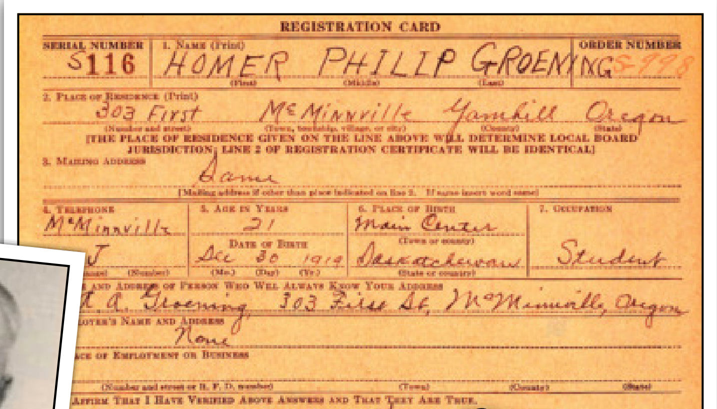
Homer shared his dad's intellect but not his ethics. "I was born a peaceful Mennonite, but when I grew up, I dropped bombs on Paris [in the Second World War]," the Distinguished Flying Cross recipient told *Sightlines*, a journal of his main vocation: filmmaking.

During the Second World War, Homer married Margaret Wiggum. They had five children. In the 1980s, their youngest son, Matt, modelled the Simpson family after his own — but in name only. "My dad didn't even like doughnuts that much," Matthew Abram Groening told *Smithsonian Magazine*. Homer died in Portland in 1996. In 2002, Matt incorrectly stated that Homer was from Winnipeg. Recently asked about her family's fugitive Saskativities, Matt's sister Lisa replied they were "things I knew nothing about."

On May 4, 1950, Regina's *Leader-Post* newspaper listed farmers with unclaimed earnings from the Canadian Wheat Board. Entitled to $28.21 was Abram Groening from Main Centre. But no need to mourn Abe's uncashed wheat cheque; his other Prairie crop made billions.







REGISTRATION CARD

SERIAL NUMBER S116 | 1. NAME (Print) HOMER PHILIP GROENING (First) (Middle) (Last) | ORDER NUMBER S998

2. PLACE OF RESIDENCE (Print) 303 First McMinnville Yamhill Oregon (Number and street) (Town, township, village, or city) (County) (State)

[THE PLACE OF RESIDENCE GIVEN ON THE LINE ABOVE WILL DETERMINE LOCAL BOARD JURISDICTION; LINE 2 OF REGISTRATION CERTIFICATE WILL BE IDENTICAL]

3. MAILING ADDRESS Same

[Mailing address if other than place indicated on line 2. If same insert word same]

4. TELEPHONE McMinnville J (Exchange) (Number) | 5. AGE IN YEARS 21 DATE OF BIRTH Dec 30 1919 (Mo.) (Day) (Yr.) | 6. PLACE OF BIRTH Main Center (Town or county) Saskatchewan (State or country) | 7. OCCUPATION Student

NAME AND ADDRESS OF PERSON WHO WILL ALWAYS KNOW YOUR ADDRESS A. A. Groening 303 First St, McMinnville, Oregon

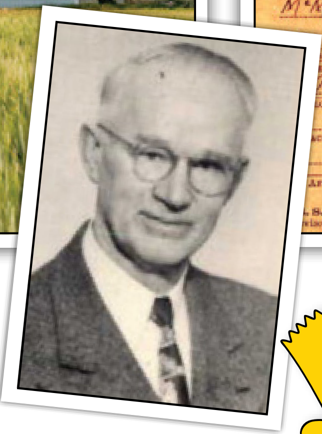
EMPLOYER'S NAME AND ADDRESS None

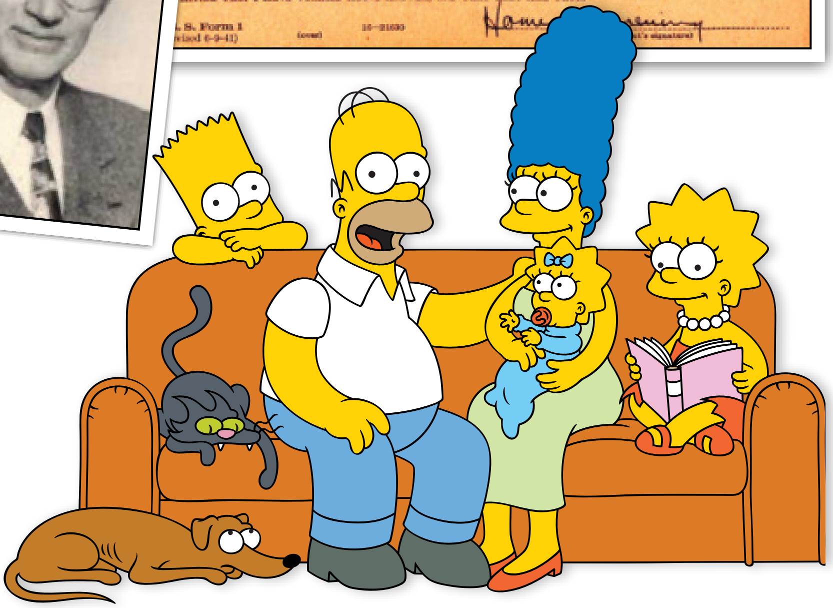
PLACE OF EMPLOYMENT OR BUSINESS

(Number and street or R. F. D. number) (Town) (County) (State)

I AFFIRM THAT I HAVE VERIFIED ABOVE ANSWERS AND THAT THEY ARE TRUE.

D. S. S. Form 1 (Revised 6-9-41) (over) 16—21630 Homer Groening (Registrant's signature)





Clockwise from BOTTOM LEFT: Abram Groening fled to rural Saskatchewan to avoid the draft; his son Homer became a filmmaker in Portland, Oregon; a self-portrait of Matt Groening, creator of *The Simpsons*; Homer's American military registration card; *The Simpsons* are named after Groening's own family.

CLOCKWISE FROM TOP LEFT: PORTLAND DESIGN HISTORY; FOX; ANCESTRY.COM/NATIONAL ARCHIVES AND RECORDS ADMINISTRATION; FOX; LEWIS & CLARK COLLEGE SPECIAL COLLECTIONS AND ARCHIVES; NANCY ANDERSON/ALAMY STOCK PHOTO

Canadian Geographic
Indigenous Peoples Atlas of Canada

POSTER MAP

Indigenous Peoples Atlas of Canada Education Program
Atlas des peuples autochtones du Canada Programme éducatif
LEGEND / LÉGENDE

This map shows the locations of Indigenous communities, residential schools, reserves and more. Rather than political borders, Canada is broken up into **INDIGENOUS LANGUAGE GROUPS.**

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- Full colour
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Canadian Geographic

The birth of a language speaker

In the first part of our Discovery Language series, one Kanyen’kehá:ka family shares what it takes to raise a language speaker

BY **SHELBY LISK**

IN THE HECTIC moments following labour, everything is hushed in the delivery room as Evin Kring begins speaking in Kanyen’kéha (the Mohawk language): “ó:nen kí:ken seksá:’a ahsatahónhsatat ne wahi tóhkara nikawén:nake,” instructing his newborn son, Elwin, only minutes into his life, to listen to the welcoming words in their language.

“The entire room went still and quiet. I just remember holding Elwin on my chest and Evin was saying the words, and just how emotional it was,” says Kring’s partner, Jessica Parks. “That we were able to take that time to welcome him Earthside within our culture and our language was something really important to us.”

Kring and Parks are among a number of Kanyen'kehá:ka families continuing the tradition of speaking the first words to their baby in their ancestral language. “The welcoming baby speech is so important because you are welcoming that spirit to the Earth,” says Parks. “Letting them know that we want you here, that this is your family — this is who’s going to love you and take care of you.”

Onkwehón:we (Original People’s) birth teachings are tied to an understanding that babies are spiritual beings who have chosen their parents and families. There is great responsibility to care for these spirits and tether them here as they transition into the physical, earthly realm. As well as the welcoming

THIS and PREVIOUS PAGE, left to right: Jessica Parks, baby Elwin and Evin Kring. The leather bracelet grounds Elwin to the Earth.

PREVIOUS PAGE: SHELBY LISK; THIS PAGE: CHELSEA SIMS PHOTOGRAPHY/COURTESY JESSICA PARKS

speech, Kring and Parks followed their traditional knowledge by having their cousin make their son a leather bracelet, which is tied on the baby's wrist to ground him to the Earth. They also worked with Onkwehón:we midwives from their community to ensure they could bring Parks' placenta home to bury it nearby, to forever connect Elwin to his community.

The welcoming words prepare the baby for their experiences here on the Earth, this place the Creator has prepared for them. They outline their connection to their family, especially to their mother, their grandmother and their clan. They also set out lifelong responsibilities as humans, including the Onkwehón:we original instructions to care for everything that has been set down on the Earth.

The couple received a copy of the speech by the late Elder Jake Thomas and, although they are not fluent speakers, did their best to pass on those words to their newborn son. Kring says he is familiar with the sounds of the language from learning a little bit as a child. “My intentions were to really have the words come out of me as best as I could.”

Parks and Kring are from Kenhtè:ke (Tyendinaga Mohawk Territory) and took Kanyen'kéha classes in school. They've both continued their language learning journey as adults by taking night classes and part-time programs. “It was emotional for me to say [the welcoming words], because both my parents are Mohawk, but they never knew about that,” says Kring. “It was nice to give our son the best possible start in this world to embrace his culture.”

The welcoming baby speech isn't just a beautiful ancient tradition; it is an act of revitalization. Kanyen'kéha is an endangered language. According to 2018 research by Kanyen'kehá:ka professor Jeremy Green, there were just 932 native speakers of Kanyen'kéha in the world, consisting primarily of 14 family lines, and the majority of fluent speakers were over 65 years old. Based on community research, there are fewer than 10 advanced-level-proficiency second language speakers in Kenhtè:ke.

> THE **WELCOMING WORDS** PREPARE THE BABY FOR THEIR **EXPERIENCES** HERE ON THE EARTH

Many First Nations believe language learning begins in the womb, and scientific study is now confirming this knowledge that has been passed down in Indigenous communities for generations. “When I was pregnant, the language was something he heard a lot in the womb, when I was in classes, or when I was doing my homework and practising,” says Parks. “I also sang to him a lot while I was pregnant, and I sing the same song to him now every night when he's going to sleep.”

Babies not only prefer their mother's voice, from hearing it in utero, but research also indicates they learn to identify intonation, stress, rhythm and volume, allowing them to more easily acquire language later in life. At birth, infants are already able to discriminate their native language from other sounds.

The couple are still speaking the language with Elwin, now a toddler, including singing and reading to him in Kanyen'kéha. “We hope that gives him an interest and a foundation that neither of us had,” says Parks. “Being a role model with our culture and language is important so that he has a strong sense of who he is and his identity, and his roles and responsibilities as a man. And it's been important for us to have that right from pregnancy.” ❄

Discovery Language is supported by the Office of the Commissioner of Indigenous Languages.

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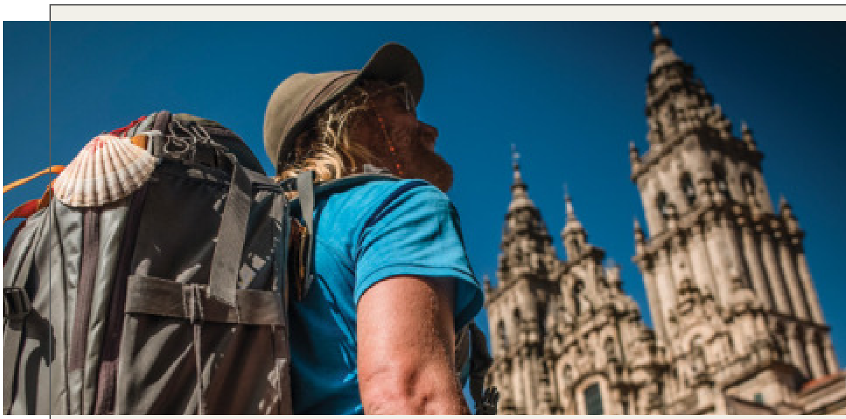

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Up in the clouds

An ambitious, multi-stage mission seeks to find life in the clouds of Venus

BY **ALEX HUTCHINSON**
WITH ILLUSTRATION BY **DAVID WYSOTSKI**

NEXT SUMMER, scientists from Massachusetts Institute of Technology will launch an uncrewed spacecraft to explore our nearest planetary neighbour — not the one you're thinking of, though. "Mars gets all the attention," laments Sara Seager, the Toronto native who is leading the project, "and Venus gets ignored." But that may soon change. Back in 2020, Seager and her colleagues published observations from two powerful telescopes suggesting, somewhere in the clouds of Venus's atmosphere, the apparent presence of phosphine — a molecule that, on Earth, is associated with living organisms.

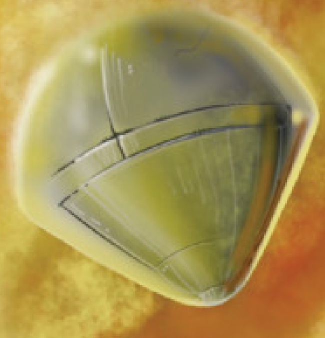
Venus is a barren hellscape at ground level, with intense atmospheric pressure and temperatures hot enough to melt lead. Up in the clouds, however, the temperature and pressure are more Earth-like. In the 1960s, astronomer Carl Sagan suggested those clouds might sustain life. The catch: the clouds are made of sulphuric acid. After the phosphine observation, Seager ran a series of experiments showing that certain amino acids and DNA components — building blocks of life — *can* stay intact in sulphuric acid.

Next year's launch is part of Seager's Morning Star Missions, an ambitious multi-part plan to see whether these clues add up to extra-terrestrial life. The spacecraft will drop a small probe that will search for the presence of anything other than sulphuric acid during a five-minute plunge through the clouds. "We send an ultraviolet laser out into the clouds, and if we see it light up — fluoresce — it's a good sign because it likely means there's organic molecules in the cloud particles," Seager explains.

Assuming there *are* molecules there, the next step is to get a positive ID. The follow-up **mission, slated for 2031**, will deploy a balloon that stays aloft for a full week and scatter 30 microprobes designed to spin like falling maple seeds as they gather atmospheric data. The balloon fabric is "absolutely top secret," says inventor Maxim de Jong of Chilliwack, B.C.-based Thin Red Line Aerospace. It will have to float in clouds of sulphuric acid and resist the extreme heat near the bottom of the cloud layer while still being light enough to launch into space. That's a big ask, and it's just one of the challenges facing Seager's team. But as de Jong says, "life is too short to work on something that doesn't challenge you to the absolute fullest." ✦

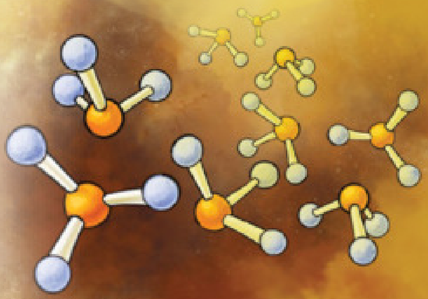
2026 MISSION

In 2026, California-based Rocket Lab will launch a largely privately funded mission to Venus with its **NEUTRON ROCKET** carrying the scientific payload designed by Sara Seager's team.



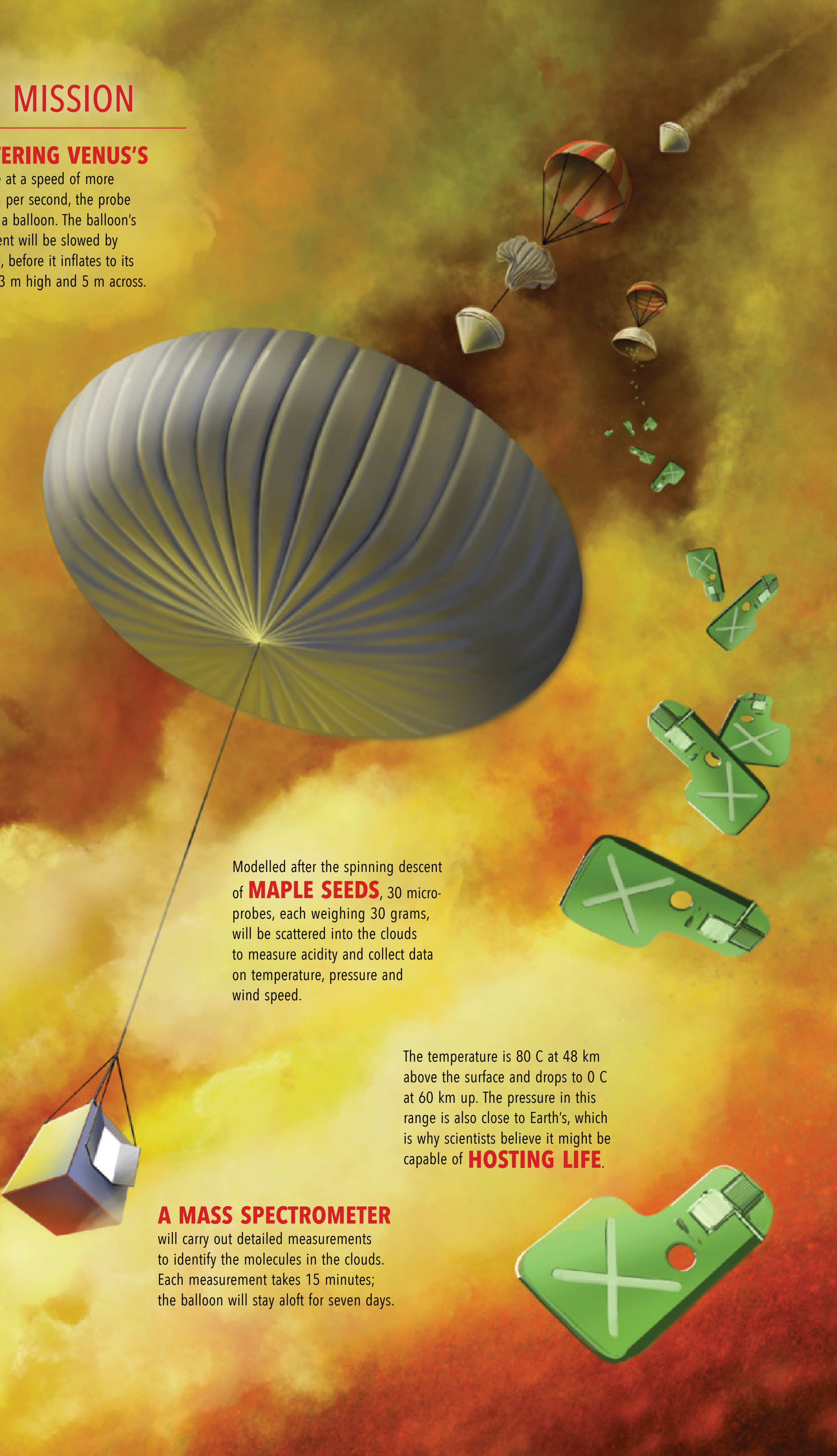
The spacecraft will drop a probe that shines an **ULTRAVIOLET LASER** into the clouds and watches for flashes of light that indicate the presence of organic molecules. The probe will have about five minutes to make measurements before it crashes to the planet's surface.

VENUS'S CLOUDS are primarily composed of sulphuric acid. But measurements over many decades have hinted at the presence of molecules such as oxygen, **phosphine** and ammonia, each of which could point to the presence of life.



2031 MISSION

After **ENTERING VENUS'S** atmosphere at a speed of more than 10 km per second, the probe will deploy a balloon. The balloon's initial descent will be slowed by a parachute, before it inflates to its full size of 3 m high and 5 m across.



Modelled after the spinning descent of **MAPLE SEEDS**, 30 microprobes, each weighing 30 grams, will be scattered into the clouds to measure acidity and collect data on temperature, pressure and wind speed.

The temperature is 80 C at 48 km above the surface and drops to 0 C at 60 km up. The pressure in this range is also close to Earth's, which is why scientists believe it might be capable of **HOSTING LIFE**.

A MASS SPECTROMETER will carry out detailed measurements to identify the molecules in the clouds. Each measurement takes 15 minutes; the balloon will stay aloft for seven days.

ON THE MAP

Exploring Cartography

In a pinch

Reconnecting habitat on the Chignecto Isthmus between Nova Scotia and New Brunswick

MAP BY **CHRIS BRACKLEY**
WITH TEXT BY **IAN COUTTS**

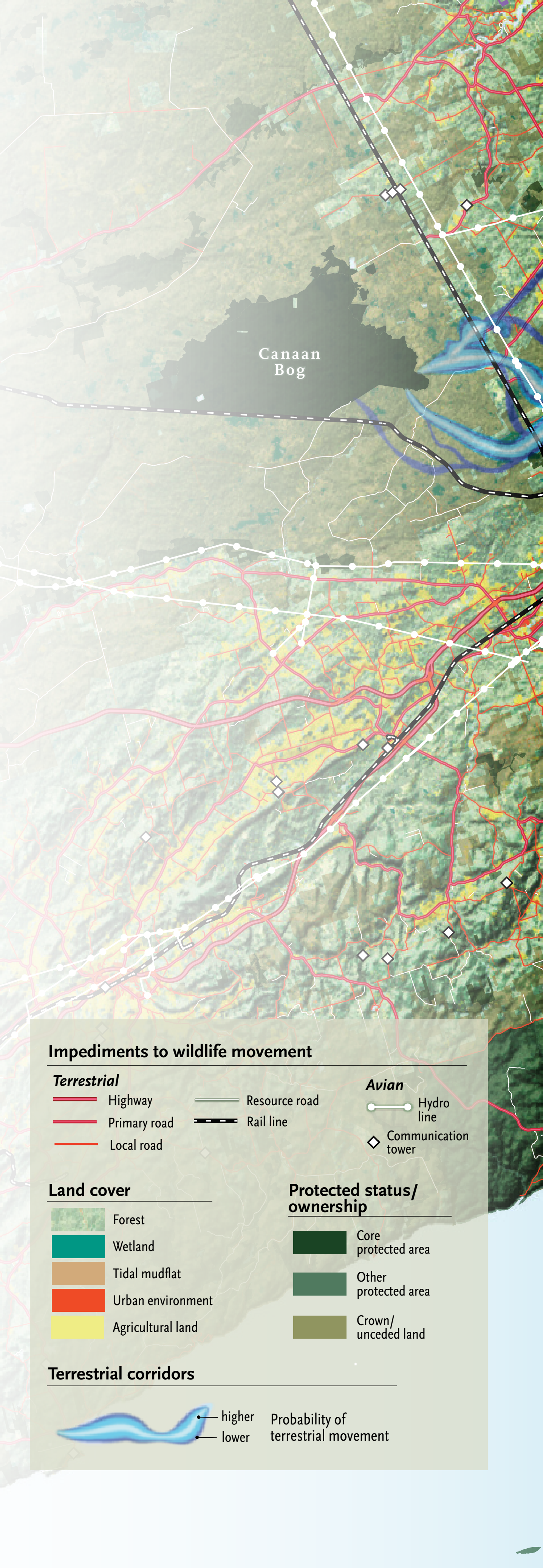
In geological terms, Nova Scotia is hanging on by a thread. The Chignecto Isthmus, a narrow strip of land that connects the maritime province to continental North America, is just 24 kilometres wide at its narrowest point and roughly 25 kilometres long — a pinch point of wetlands, forests and shoreline areas interwoven with transportation corridors, industry and communities. And as the human footprint here grows, the integrity of natural spaces and the connections between them are being whittled away.

The isthmus rests in the Siknikt region (meaning "drainage place") of Mi'kma'ki, the Mi'kmaq homeland. Its wetlands, including tidal flats, salt marshes and inland wooded wetlands, are favoured by migrating shorebirds and a wide variety of at-risk bird species, such as the Canada warbler. The isthmus is also the only corridor connecting Nova Scotia's endangered mainland moose population to the rest of North America. Today, many of these wetlands have been lost to agriculture, and once-vast swaths of Acadian forest have been logged. Communications towers and powerlines endanger migrating birds, while highways pose a risk to moose and other migrating mammals. Much of the isthmus's wildlife has become trapped in isolated pockets of nature, unable to move freely between them.

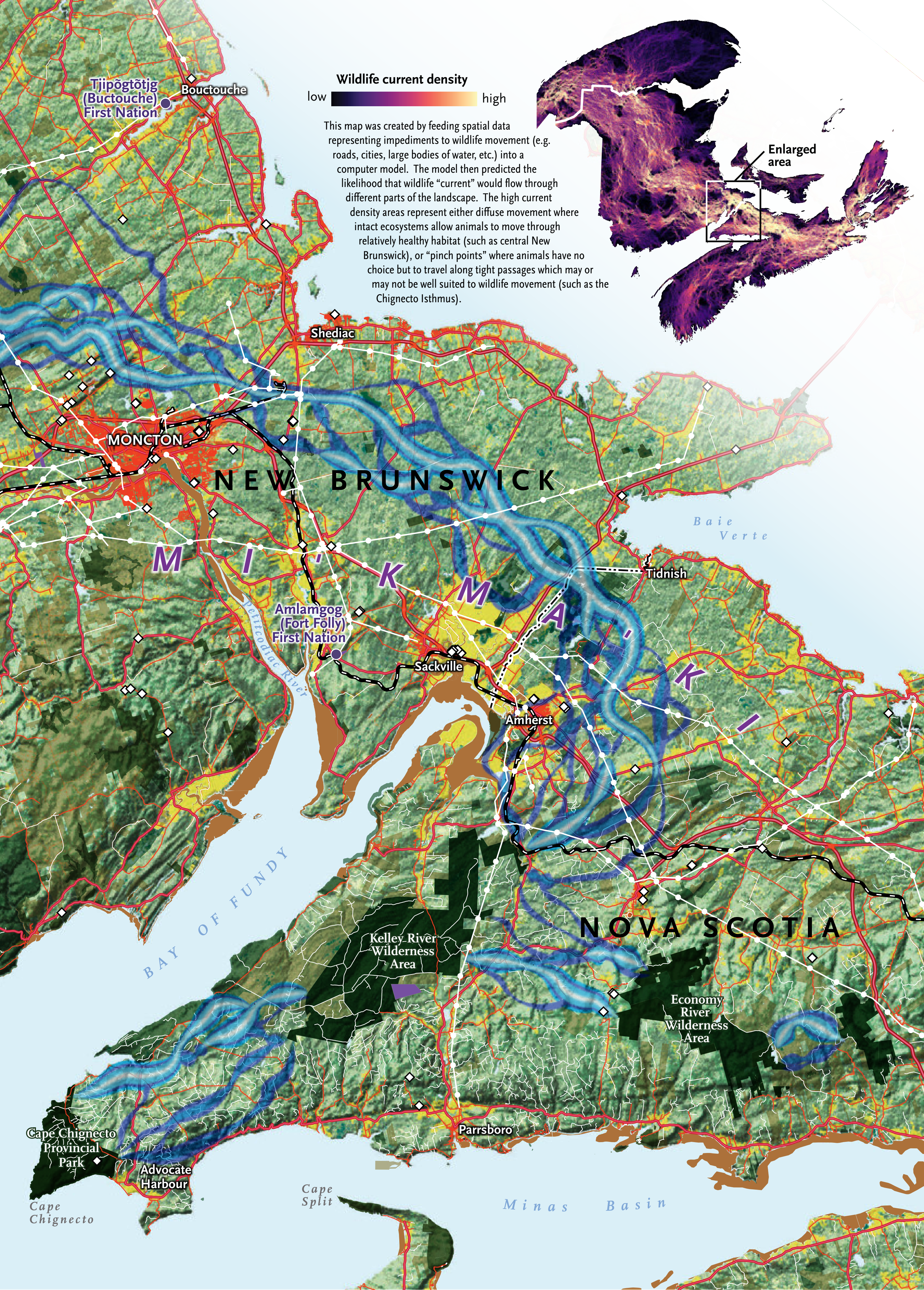
Chignecto has been identified by Parks Canada as one of 23 priority areas across the country where ecological connectivity is in urgent need of restoration and conservation. A coalition of conservation groups, Indigenous Peoples, scientists and citizens, called the Chignecto/Sikniktewaq Partnership, is working towards this goal. It will spend the next year surveying the area's connectivity, from monitoring bird flight paths to investigating wildlife crossings on highways to engaging with private landowners who hold the bulk of the land in the area. And a new Indigenous Protected and Conserved Area is being pursued — a collaboration between the Nature Conservancy and the Amlamgog (Fort Folly) Mi'gmaq to purchase up to 81 hectares of land on the isthmus. Kelsey Butler of Birds Canada, the group leading the initiative, says the ultimate goal "is about finding the balance" between the area's human and non-human users.

The stakes are high, but connection — between communities and organizations, wildlife and habitat — will hopefully bolster this vital ecological link. ❁

This story is part of a series about ecological corridors produced with support from Parks Canada. See more at cangeo.ca/rightofpassage.


Canaan Bog
Impediments to wildlife movement
Terrestrial
Highway
Primary road
Local road
Resource road
Rail line
Avian
Hydro line
Communication tower
Land cover
Forest
Wetland
Tidal mudflat
Urban environment
Agricultural land
Protected status/ ownership
Core protected area
Other protected area
Crown/ unceded land
Terrestrial corridors
higher
lower
Probability of terrestrial movement

DATA CREDITS: BASE DATA: CANVEC 1:50 000, NATURAL RESOURCES CANADA, 2019. OPEN GOVERNMENT LICENSE - CANADA 2.0 TERRESTRIAL CORRIDOR: GENERALIZED FROM A WILDLIFE CONNECTIVITY ANALYSIS FOR THE CHIGNECTO ISTHMUS REGION FINAL REPORT TO THE HABITAT CONSERVATION FUND, NOVA SCOTIA, FIGURE 3, NATURE CONSERVANCY CANADA, 2016.

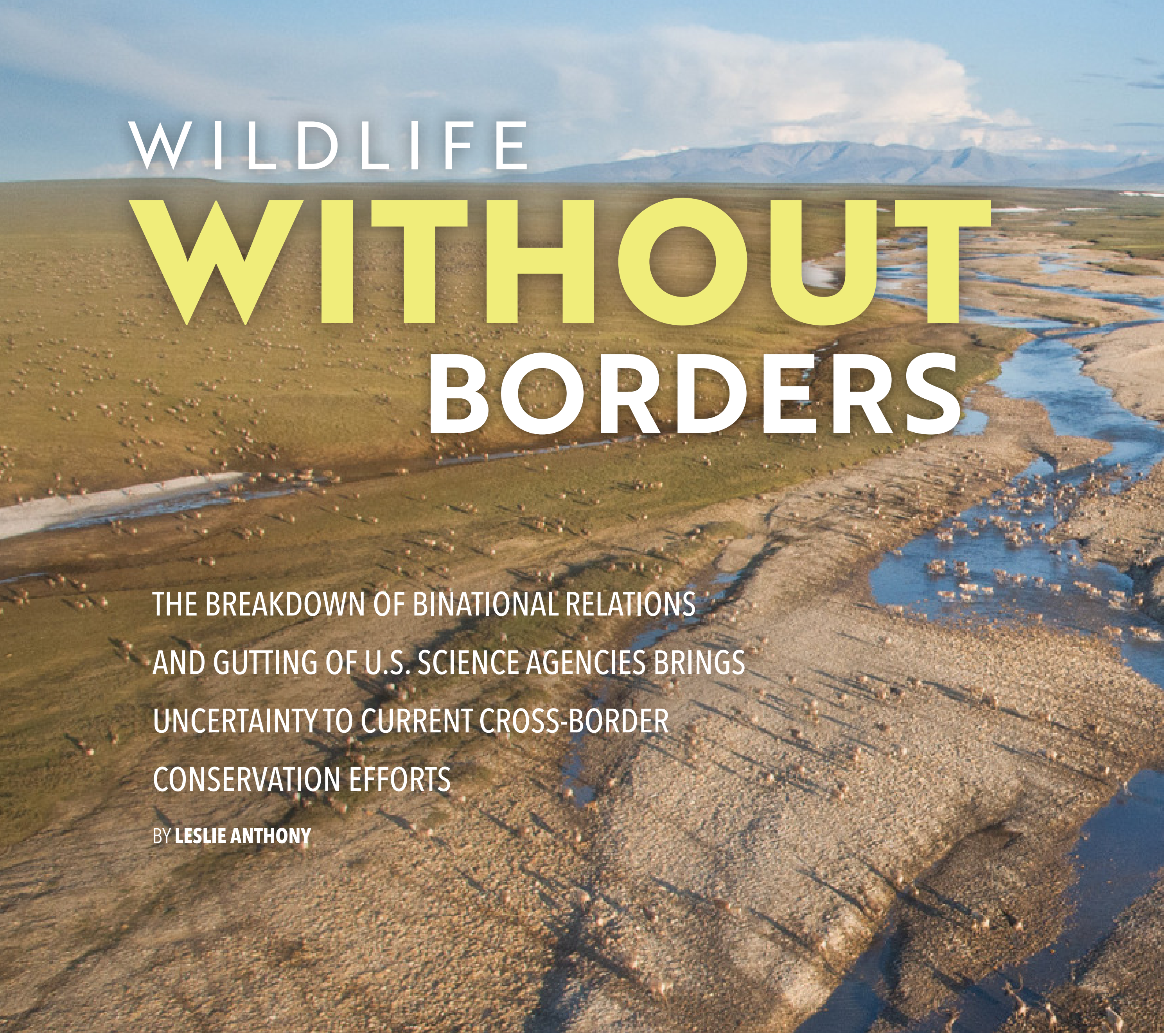


Wildlife current density

low ▬ high

This map was created by feeding spatial data representing impediments to wildlife movement (e.g. roads, cities, large bodies of water, etc.) into a computer model. The model then predicted the likelihood that wildlife "current" would flow through different parts of the landscape. The high current density areas represent either diffuse movement where intact ecosystems allow animals to move through relatively healthy habitat (such as central New Brunswick), or "pinch points" where animals have no choice but to travel along tight passages which may or may not be well suited to wildlife movement (such as the Chignecto Isthmus).

Enlarged area
Tjipõgtõtjg (Buctouche) First Nation
Bouctouche
Shediac
MONCTON
NEW BRUNSWICK
M I ' K M A ' K I
Baie Verte
Tidnish
Amlamgog (Fort Folly) First Nation
Petitcodiac River
Sackville
Amherst
BAY OF FUNDY
NOVA SCOTIA
Kelley River Wilderness Area
Economy River Wilderness Area
Cape Chignecto Provincial Park
Advocate Harbour
Parrsboro
Cape Chignecto
Cape Split
Minas Basin



WILDLIFE WITHOUT BORDERS

THE BREAKDOWN OF BINATIONAL RELATIONS AND GUTTING OF U.S. SCIENCE AGENCIES BRINGS UNCERTAINTY TO CURRENT CROSS-BORDER CONSERVATION EFFORTS

BY **LESLIE ANTHONY**

CANADA IS HOME to some of the planet's most extraordinary animal migrations. Perhaps best known are the spawning runs of adult salmon that make their way out of the Pacific and up myriad waterways to the streams of their birth, distances that can exceed 1,500 kilometres. Arctic terns likewise make a staggering return journey from the Arctic to Antarctic, flying more than 40,000 kilometres each year. But perhaps most iconic of all are the millions of monarch butterflies that gather in the mountains of central Mexico each winter, painting fir trees in preternatural black and orange after an eight-month, out-and-back cross-continental epic of some 4,500 kilometres, in which five generations are born and die.

No surprise, then, that monarchs are the poster species for the 1995 Canada/Mexico/U.S. Trilateral Committee for Wildlife and Ecosystem Conservation and Management, a model for cooperative continental conservation across a shared array of ecosystems, habitats and species. Along with other conservation endeavours spanning the continent, the agreement does so in the spirit of neighbour-supporting-neighbour. An often-fractious jigsaw of inter- and intranational jurisdictions, agencies, Indigenous nations, NGOs and special interest groups work together for the good of all who occupy these landscapes. Though the monarch's spectacular journey represents an ancient rhythm, it's one increasingly buffeted by gusts of development, habitat loss and pollution, leading to its listing as an endangered species. And now there's another headwind — politics. Malign actions of the current U.S. administration have opened up a country-sized conservation hole in the middle of the monarch's migration route, affecting not only this butterfly but the conservation and collective management of ecosystems and myriad species from waterfowl to wolverines to whales.

While unjustified tariffs that threaten the well-being of all North Americans were dominating the news cycle, Trump 2.0 was simultaneously taking a wrecking ball to international institutions concerned with health, science and the environment. This included replacing directorships with manifestly unqualified individuals, overt ideological politicization of formerly non-partisan institutions (supported by disinformation emanating directly from the Oval Office — transgenic mice, anyone?), indiscriminate mass firings and layoffs, Orwellian restrictions on research and communication that make Stephen Harper's muzzling of government scientists seem like a sandbox scrap, and funding cuts and grant freezes involving hundreds of millions of dollars that disproportionately affect graduate students and early career researchers — literally an entire generation of American science. These actions had immediate effect on everything from world-leading biomedical research to life-saving international development work and pollution vigilance, from key science-and-education funding to land and park management, and from critical atmospheric, ocean and weather data to natural disaster relief.

The virtual gutting of America's main climate agency, the National Oceanic and Atmospheric Administration, saw former chief scientist Craig McLean lament that U.S. science now risked becoming a "backwater enterprise." Venerable British journal *Nature* cast a broader net with the headline "An assault on science anywhere is an assault on science everywhere."

"There are many ways the pointless and bizarre antics of the president are undermining relationships with Canada in general that are also detrimental to species shared between our nations — or the land, air and water they occupy," says Brett Hartl, government affairs director at the Center for Biological Diversity in

Washington, D.C. “We’re still trying to figure out where the worst on-the-ground impacts will be, so our biggest question is: how bad are things going to get?”

HARTL’S worries aren't just about individual species but the human relationships and organizations dedicated to their preservation. The Algonquin to Adirondacks Collaborative, known as A2A, is a U.S., Canada and First Nations partnership working with scientists, policymakers and conservation groups to maintain ecosystem and genetic connectivity across a biodiverse region of hardwood and mixed forest spanning eastern Ontario and upstate New York. Home to an array of both wide-ranging and endemic wildlife, the organization’s website calls it “one of the last large-scale, intact forest and wetland linkages left in Eastern North America ... [and] the best remaining potential for wildlife movement across the Great Lakes-St. Lawrence system.”

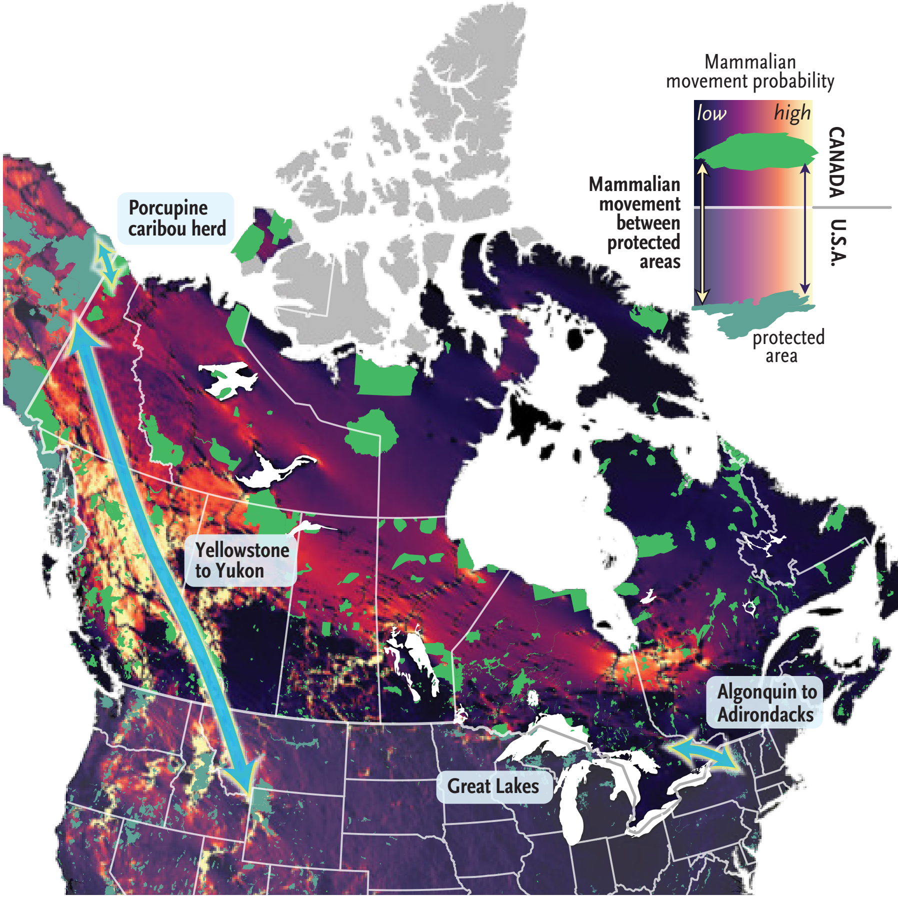
A2A Executive Director Jess Lax echoes Hartl’s sentiments. “Information sharing is impacted when relationships are impacted,” she says of issues with an upcoming biennial meeting to be held in the U.S., but for which funds — and motivation — are now lacking. “If Canadians [don’t want to or can’t attend], we’ll see that down the road — relationships won’t be as strong.”

“AN ASSAULT ON **SCIENCE ANYWHERE** IS AN ASSAULT ON SCIENCE **EVERYWHERE.**”

It’s a critical consideration when information gathering itself is at stake. An important aspect of A2A’s work is habitat and connectivity mapping used to prioritize which land to protect in order to maximize benefits for stay-at-home species like fungi and turtles, as well as to support larger, more mobile species whose long-distance movements are critical to gene-flow. With money from Canada for north of the border and federal National Park Service money to cover the American work, the latter was only partially complete before funds were cut. If money can’t subsequently be found elsewhere, this could result in working from only a partial picture of the landscape going forward. “That adds a big wrench to the plan — and a lot of uncertainty,” says Lax. “We’d been working on it for 18 months and were hoping to finish by fall 2025. But that doesn’t seem like it can happen now.”

With planned habitat protection becoming a much more protracted process, organizations like A2A are forced into a more cautious stance; perspectives change on what’s possible in the moment, but also on vigilance for long-term repercussions that can’t yet be realized. One likely impact is in the area of road ecology and wildlife crossings, for which the U.S. typically had more money than Canada. When U.S. agencies were gearing up to do something big on that front, Lax notes, it created momentum for all parties to build on. “Now those funds are likely gone, along with some capacity, and their attention

Porcupine caribou (PREVIOUS) in the Arctic National Wildlife Refuge, Alaska. A grey wolf (LEFT) in Kootenay National Park, B.C., in the Y2Y corridor.



likely has to be focused elsewhere," she says.

Which is unfortunate for wide-ranging critters like Alice the Moose, A2A's emblematic mascot. Radio-collared in New York state's Adirondack Park in 1998, Alice travelled some 570 kilometres to Ontario's Algonquin Provincial Park, crossing a border, the St. Lawrence River and Highway 401 in the process. "It's already a complex thing to figure out which species benefit most from road crossings, and this just further complicates things," laments Lax.

SPANNING FIVE American states, four Canadian jurisdictions and some 75 Indigenous territories along the northern spine of the Rocky Mountains, the 1.3 million square kilometres encompassed by the Yellowstone to Yukon Conservation Initiative form the most intact large-mountain wildlife region in the world. Since 1993, Y2Y has worked with hundreds of partners on the "big, bold idea" of protecting interconnected, biodiverse wildlands and freedom to roam for grizzly and black bears, wolves and mountain lions, caribou and moose, bighorn sheep and mountain goats — as well as a catalogue of smaller wildlife and biodiverse valley and alpine ecosystems that support them. Knowing that keeping such a vast and vital region intact is the best way to tackle both the loss of biodiversity and a changing climate, Y2Y addresses the critical needs not only of the region's wildlife but also of its human inhabitants.

Within the corridor lies the spectacular Waterton-Glacier International Peace Park, a 1932 union of Alberta's Waterton Lakes National Park and Glacier National Park in Montana that represents both a symbolic and functional part of Y2Y. With its glaciated peaks, canyons, boreal forest, prairie grasslands, deep glacial lakes and rivers that flow to three separate oceans, the variety of front-range ecoregions is matched by a diversity of wildlife that includes the megafauna listed above, a litany of birds and a celebrated elk herd that migrates annually between summer alpine habitat in Glacier and winter prairie ranges in Waterton. These features make it a popular destination for both Americans and Canadians. But because conservation relies so heavily on people power, staff cuts on one side of the park will affect not just its ability to serve the public but the species it's meant to jointly protect.

"Ten years ago, we held a big international meeting on transboundary conservation where someone brought up the difference between negative peace — the absence of conflict — and positive peace — the action of working together to resolve shared challenges and opportunities," recalls Jodi Hilty, president and chief scientist at Yellowstone to Yukon. "That has really come back around for me today because it makes transboundary conservation, which is all about shared values and efforts, more meaningful than ever; something we always took for granted in the Y2Y region now holds a new significance."

Transboundary conservation efforts can also be fiendishly complex. The International Porcupine Caribou Agreement between Canada and the U.S. is a legally binding 1987 treaty to coordinate conservation of the large transnational Porcupine caribou herd that migrates annually between Alaska, Yukon and Northwest Territories. The herd's more than 250,000-square kilometre range comprises 12 areas within which five different agencies (Canadian Wildlife Service, U.S. Fish and Wildlife Service, and the Alaska, Yukon and N.W.T. departments dedicated to fish and game) have jurisdiction. Thus, herd governance, by both a

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PREVIOUS SPREAD: PETER MATHER. THIS SPREAD: JOHN MARRIOTT. MAP: CHRIS BRACKLEY/CAN GEO. DATA: WORLD PROTECTED AREAS DATABASE 2021, PROTECTED PLANET; A. BRENNAN, ET. AL. FUNCTIONAL CONNECTIVITY OF THE WORLD'S PROTECTED AREAS. SCIENCE 376, 1101–1104 (2022) 3 JUNE 2022

multinational board and technical committee, involves two federal and three state/territorial governments, eight Indigenous land claim agreements, six national and territorial parks or preserves, and two wildlife management areas. A model of co-operative management, it has also been successful.

Herd management is based foremost on aerial censuses. And while a 2017 effort estimated more than 200,000 animals — the highest since the 1970s — recent attempted updates have been hampered by issues both ecological (e.g., the herd not fully aggregating) and environmental (e.g., heat and wildfire smoke).

Unfortunately, because it uses Alaska's ever-contentious Arctic National Wildlife Refuge, the Porcupine caribou herd has also become a political football between U.S. Republicans, Democrats and native Alaskans. Mark Hebblewhite, a Canadian researcher, former board member of Y2Y, and professor of wildlife biology at the University of Montana in Missoula has spent time with the herd. "During the first Trump administration,I was working with [the Bureau of Land Management] in Alaska when they were directed to open up all their lands for drilling," he recalls. "Because it's some of the most expensive oil and gas on the planet to develop, when they had a sale on leases, there were only four bids. There will probably be a re-emergence of threats to [drill], but the economics of accessing this resource under free markets might sink it." That can only be good news for the herd, which, by nature of its binational peregrinations, is sensitive to habitat impacts on either side of the border.

THIS PAGE, **clockwise from TOP LEFT:** Wildlife in the A2A corridor, including great horned owlets, a moose, an American goldfinch and a monarch butterfly. OPPOSITE, **clockwise from TOP LEFT:** Yukon's Tombstone Territorial Park in the Y2Y corridor; wildlife in the corridor include grizzly bears and wolverines.

As for how herd management might be affected by cuts, Hebblewhite defaults to one of ecology's favoured rubrics: context-dependency. "It's contingent on so many things," he says. "Like, who specifically got fired? Are they involved in harvest management? If you don't have harvest data from First Nations and native Alaskans, you're missing a key management component. And getting that data is based on hard-won relationships of mutual trust between individuals; trust that comes slowly but is easily lost [if the people disappear]."

He also points to the colossal task of keeping track of the herd. A pause on U.S. spending could mean no survey aircraft all summer. “It’s hard enough to count caribou but harder still when half the team is missing and no one can write a cheque,” he says.

The flow of money across borders in these enterprises is all the more fraught because it’s asymmetrical. Canadian conservation groups have a history of tapping into U.S. funds to improve our own country’s relatively weak record of environmental stewardship, a reality spurred by toothless species protection laws, little funding and minimal enforcement of protected lands that’s likely to create more gaps. As an example, Hebblewhite led a study analyzing how protected areas within the Y2Y complex were expanding, finding that while 70 per cent of the budget came from U.S. sources, barriers to acquiring land in the U.S. meant that 70 per cent of the spending — and thus expansion of protected areas — was in Canada.

THE **POINTLESS** AND **BIZARRE** ANTICS OF THE PRESIDENT ARE UNDERMINING RELATIONSHIPS WITH **CANADA.**

Though this new regime is bad news for Y2Y, Jodi Hilty believes motivation on both sides of the border can help weather the storm. “When the U.S. listed wolverines as endangered last year, it was clear the species couldn’t remain viable in the Lower 48 unless it stayed connected to the Canadian population and that the biggest barrier was the need to get wildlife safely across roads,” she says of a range of wildlife crossing projects approved or underway in both countries. “Funding may be a question mark now, but these regions are *really* committed to this stuff, and so continuing conversations to support these efforts in the context of a larger landscape is important. Having something that’s bigger than any one region keeps people engaged.”

MEANWHILE, executive orders that stripped away protections for terrestrial wildlife and the environment are also affecting transboundary aquatic conservation.

Cherished on both sides of the border as both home and a source of drinking water, food, recreation, trade and transport for some 30 million North

OPPOSITE: OH ME NERVES PHOTOGRAPHY | SHAUN ANTLE. THIS PAGE: SONNY PARKER

Porcupine caribou migrate across Alaska, Yukon and Northwest Territories .

© RON ERWIN

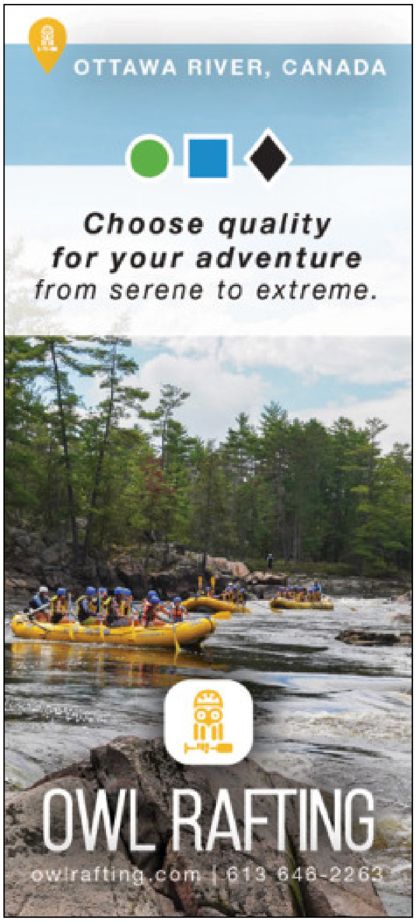
Americans, the Great Lakes are the largest and most diverse freshwater ecosystem on Earth. The binational Great Lakes Fishery Commission has, for more than seven decades, coordinated Canadian and American government agencies and conservation groups in protecting the lakes' $5-billion commercial and recreational fisheries from overexploitation, pollution and the scourge of invasive species. But now, staffing cuts to its long-running control program for invasive sea lamprey — a fish parasite common to top predators like lake trout and whitefish that single-handedly almost destroyed the Great Lakes fishery in the 1950s — threaten the entirety of this vast, mid-continental treasure.

And out east, with fewer than 380 of their kind remaining, North Atlantic right whales endangered by ship strikes and fishing-gear entanglements now face the added danger of indifference from U.S. policy. "This is a species, like any wild animal, that doesn't recognize borders, so what happens in the U.S. can impact in Canada," Kim Elmslie, campaign director for Oceana Canada, told CBC. "Rolling back or changing measures in the U.S. could hasten this species' decline and potential extinction."

Although pushback is coalescing in the U.S., it's hampered by many in the scientific establishment being intimidated into silence by the threat of further job loss. And while the 100-plus lawsuits filed against the Trump administration by everyone from worker's rights groups to Hartl's Center for Biological Diversity can claim a few early wins, it's mostly a glacial process in a time of urgency. Fortunately, there's the energy of youth to counter. Launched by five early- and mid-career scientists, "Stand Up for Science" became an instant national movement to defend the discipline as a public good and central pillar of social progress. March 7 saw official protests in 32 U.S. cities and statements of support from international organizations, like Canada's Evidence for Democracy, who understand such assaults as very much about their own country's internal politics.

Environmental issues also apply to humans, with many people working to ensure water and air pollution generated in one country doesn't hurt the other. "Essentially, I see a general disruption of the ability to cooperate on any environmental challenge," says Brett Hartl, deriding the meteoric impact of Trump's actions on institutional knowledge, expertise and capacity to address complexities that took enormous effort over decades to accrue. "People burning [this] down in the most random, untargeted way is going to make it hard to rebuild. The cumulative effects of attacks on every agency are, in the end, going to be far more costly than the money saved from any individual action."

And yet, it's that same human component and history of cooperation that might pull us through in the end. A single truculent foe may threaten monarchs and other migratory species, binational wildlife corridors and waterways, but more progressive governments and people passionate about the protection of these species and environments are unlikely to give up on a way forward. "To the degree that non-governmental organizations can continue to work in a transboundary way," says Jodi Hilty, "these efforts will likely prove to be [most] important to the long-term health of both countries."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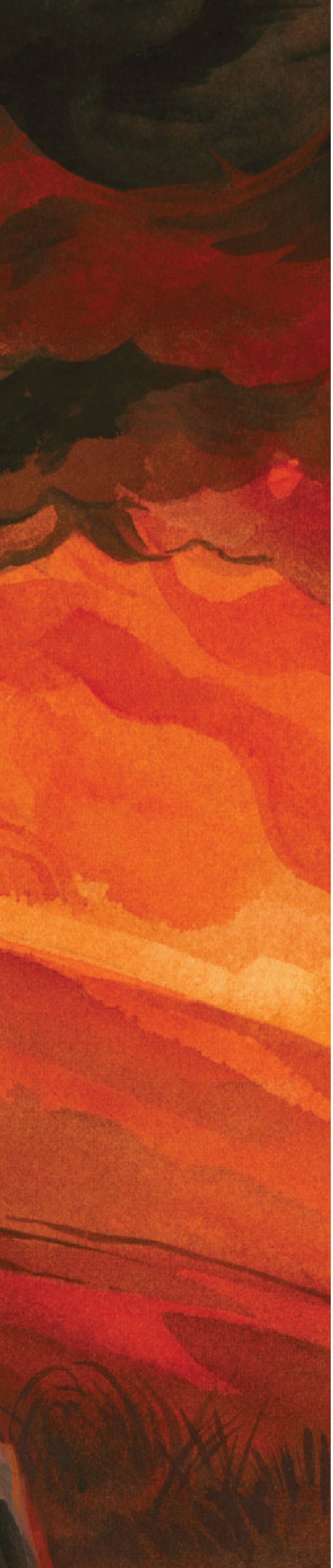

The great turning

ANOTHER RECKONING IS COMING WITH CLIMATE CHANGE. HOW DO WE DEAL WITH OUR MENTAL HEALTH – AND ULTIMATELY FIND HOPE?

BY **LAURIE SARKADI**
ILLUSTRATIONS BY **MARY SANCHE**

I'M WALKING up a ridge of bedrock outside my house, talking to my brother 1,800 kilometres south in Calgary, when it hits me like a hurricane. The fears, the confusion, the existential dread that have been building in me for decades unleash in an emotional maelstrom.

"I'm worried they won't be able to breathe... What if there's no water?" I sob while lichens, desiccated from two years of drought, crunch into airy puffs at my feet and I choke on smoke that has consumed the southern Northwest Territories in a hotbed of wildfire emergencies.

"Oh, don't think like that!" my brother says. "Think happy thoughts."

I love my only sibling deeply. Yet in July 2023 — a month before three encroaching wildfires force my family, the city of Yellowknife and surrounding Dene communities to evacuate — I need a safe place to talk about the darkness creeping into my head and heart. The birth of five grandchildren, with a sixth on the way, has sharpened my focus on the precarity of their futures inside an escalating climate crisis. The first babies were born into the confines of a global pandemic; their siblings arrived under sickened, orange-black skies from May to September.

The accumulation of carbon dioxide throughout almost three centuries of industrialism, extraction, colonialism, consumerism and capitalist greed has landed on my northern doorstep. I stare down the belly of that fiery beast as it tries to block my way into the subarctic taiga I have come to know and love. Temperatures near the Arctic Circle break 37.4 C. Ice on Great Slave Lake, the deepest in North America, melts early, while to the south the Hay River turns bone dry and waterfalls slow to trickles.

For several years, the buzz of once-legendary swarms of mosquitoes and black flies have been replaced with eerie silence. In June, I stand on the quiet shores of the lake in front of my house and contemplate a life without loons.

This is my summer of awakening. My tipping point. The challenge becomes how to "be well" in this new climate-disrupted place (that is only going to get hotter) so I can serve it and the younger generations set to inherit the joys and sorrows yet to come.

I'm scared and angry but ready for a fight, a reckoning. Big Oil has exhausted me. So, I face off with myself — a lonely, no-holds-barred psychological wrestle with grief.

◆

THE 2023 SUMMER OF SMOKE, during the world's hottest year on record before 2024, saw more than 200 communities evacuated across Canada, 19 in the Northwest Territories. In one study on evacuations here, mental health emerged as the biggest challenge. People had "primary anxiety and depression" from the evacuation, "but there's also the secondary consequences where you're losing your income, or your kids aren't in school for a month, or you're losing your insurance or you're separated from your friends and family," says Yellowknife student researcher Kira Young. Many people talked of persistent post-traumatic stress and eco-anxiety after evacuation.

I fully expected talk of climate change and action would be *everywhere* when we returned. There was initial talk of harrowing drives through smoke and flames down our only highway south to Alberta and what people did once they reached safety. But on the broader implications of the planetary health crisis: crickets.

My life feels out of **alignment** because the systems supporting my life are *misaligned*.

There never seemed to be the right space or time to raise the issue of climate threats in social conversation, let alone discuss how they made me *feel*. I didn't want to infect others with my bone-deep melancholy. "Did you know that six out of nine planetary boundaries needed to sustain life on Earth have already been breached, and oceans are perilously close to becoming the seventh?" is what I wanted to say. "Pass the salad," is what came out.

People were struggling to get back to Business As Usual, because that's what we do. That's what we've always done. That's why we're in this hot mess.

Business As Usual didn't make sense. Science was saying we had already surpassed the Paris Agreement's recommended limit of a 1.5 C global temperature increase past pre-industrial levels and are on course for a catastrophic increase of about 2.7 C by 2100 — quadruple that for the polar regions. Yet everything else in my life implored me to *Buy!*

Travel! Consume! Keep dishing out those greenhouse gases!

The western world's growth imperative is the wrong playbook. In 1972, The Limits to Growth used early computer models to show if worldwide economic growth continued without regard for environmental costs, "we would reach and then overshoot the carrying capacity of the Earth at some point in the next one hundred years." As predicted, we are starting to see those cracks with rising levels of poverty, pollution, water scarcity, food insecurity, forced displacement... the list goes on.

My life feels out of alignment because the systems supporting my life are *misaligned*. I isolate myself from social functions because the "not talking about it" feels like a betrayal to the urgent, COVID-level-degree of international crisis management I think we all should be lobbying for and coordinating.

Keep in mind, I'm doing none of that. From my deflated vantage point on the couch, weighted by a heaviness that feels like Mother Nature and all the innocents caught in armed crossfires everywhere are bearing down on my chest, I worry something is very wrong with me.

According to some experts, I'm having a reasonable emotional reaction in sync with the suffering planet of which we're all a part. Eco-anxiety, ecological grief, eco-distress and climate anxiety are all largely interchangeable shorthand for the "challenging feelings" people have once they awaken to the planetary health crisis, writes Britt Wray in *Generation Dread: Finding Purpose in an Age of Climate Crisis*. More commonly, she says, these feelings are just called "fear, terror, anxiety, depression, despair, overwhelm, stress, worry, sadness, rage, grief, guilt, heartbreak, dread."

Wray suggests eco-anxiety is "merely a sign of attachment to the world." A moral emotion. Not an illness. Environmental philosopher Glenn Albrecht calls this emotional attachment to "perceived or felt states of the Earth" *psychoterratic*.

* * *

AS DAMAGES ramp up globally from the climate crisis — like the estimated U.S. $100-billion in destruction from hurricanes Helene and Milton, or the $1.2 billion in insured losses from last summer's wildfires in Jasper, Alta. — Albrecht says "the insanity of deliberate climate warming will shock all the generations, and they will enter all forms of negative psychoterratic states. It will shake the foundations of current human identity to its core."

I see my own shaking foundations in that proclamation which, while profoundly disturbing, is also strangely comforting. I feel less isolated. Seen. It also helps explain my cognitive dissonance: that uncomfortable schism

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when the brain holds two conflicting thoughts at the same time — *the climate crisis is killing people: let's party like it's 1999*.

"Even *thinking* about this is really scary," Courtney Howard — an emergency room physician, vice-chair of the Global Climate and Health Alliance, mother, dancer and writer — tells me from her kitchen overlooking Yellowknife's Back Bay. Talking about it "helps everybody realize: 'I'm not alone.' It normalizes those feelings, and when we normalize and are vulnerable with one another ... it actually naturally brings us into the community that we need to solve problems."

Howard says people move from "not knowing what they don't know," where they think climate change is something in the distance that others will take care of, to having some awareness of the climate crisis, to experiencing a "climate awakening" that often leads to a feeling of shock when they realize what biodiversity and ecosystem loss will mean for themselves and those they love. Her own awakening left her "curled up in the fetal position" around her nine-month-old daughter.

For older generations who grew up without consciousness of the climate crisis and have had only semi-consciousness (or denial) of it as adults, that shock, that grieving — in all its painful, love-infused glory — is difficult. No one wants it, but there comes a point where the pain of facing the cognitive dissonance starts to *exceed* the pain of learning, taking action and seeking true safety, says Howard.

"Every year as Mother Nature makes it clearer with her storms, her heat emergencies, her wildfires, her emerging infectious disease threats that the problem is *already* here — every year there's a new wave of people who mount the courage to take this on," she says.

Taking it on from a mental health point of view means there's no avoiding grief. Grieving — doing the emotional processing to the way things are — and *expressing* your feelings is one of three pathways Finnish researcher Panu Pihkala says are necessary to cope and grow from waves of eco-anxiety and eco-grief throughout our lives. He calls the other two paths "action" and "distancing."

Distancing means you unplug and spend time doing things you love. Meditation, exercise and mindfulness in nature are often recommended. Howard dances and hugs her daughters a little closer when she needs a break. "But take short breaks," she cautions, "because there's work to do."

People experiencing eco-anxiety are often told to channel their pain into activism. This action is part of Pihkala's "Process Model of Eco-Anxiety and Ecological Grief" equation. But unless you also develop what psychotherapist Caroline Hickman calls "internal activism" — a kind of emotional intelligence that lets you recognize and understand you can move through triggers like the smell of smoke or another devastating climate headline — you're prone to get stuck in your own darkness, or else burn out on the frontlines of environmental activism.

From my **deflated** vantage point on the couch, I worry something is very **wrong** with me.

What can action look like? Plant a tree, or a garden. Press politicians for change. Within months of her climate awakening, Howard spurred support for increased peer review studies into Alberta's oilsands, and led a successful campaign for the Canadian Medical Association to divest from fossil fuels.

At age 18, there has barely been a time when Kira Young has *not* been awake to the existential implications of riding her bike during Yellowknife's smoky summers. Since middle school, the McMaster University student has been involved in environmental organizations and protests and more recently joined the *Larose v. Canada* lawsuit launched by youth to push the federal government for more substantial carbon reductions.

"That's giving me a sense of purpose and I'm translating my challenging experiences with climate change and eco-anxiety and eco-grief into action and accountability," says Young. "It makes me feel pretty scared, thinking about what the world is losing right now and is going to continue to lose based on this trajectory. This is the only place we know of that can sustain us or sustain our children."

I'm peeved when Boomers suggest that youth will find a way to avert climate collapse and save us all; but it is heartening — and heartbreaking — to think that Gen Z-ers like Young carry a climate intelligence from childhood as their moral compass.

While I contemplate how to share and process my grief, maybe tackle some action, I get an auspicious call to run a writing workshop for climate anxiety. A dozen participants listen to my shaky, determined presentation, then wander off with pen and paper in hand to answer the question: How does climate change make you *feel*? Through a deluge of tears, one young woman shares her words about a cherished Elder who died during the period of evacuation.

I pass her a tissue and hold space. The caring, the solidarity, the empathy, the *love* I feel loosens the shackles of my own grief. Ecophilosopher Joanna Macy says when we "express our feelings to a compassionate witness," those feelings get delineated solid boundaries. Later, the young woman sends me a thank-you email with the completed story, which she also shares with her large Dene family. As Macy would say, her feelings had "alchemized." So had I.

* * *

THE WELLNESS teachings of Dene First Nations, who make up about a third of the Northwest Territories' population, say fulfilling your own needs is your highest priority because that allows you to connect with and care for others and all Creation.

"It's like people harvesting a moose. You harvest a moose, you fulfill your needs, but 98 per cent of the moose goes out as food to the community," says Roy Fabian, Elder and former chief of the Kátł'odeeche First Nation in southern Northwest Territories, which has lost 20 buildings to wildfires over the past three years. Under this worldview, self-care means community care. "The Europeans have all the concepts to justify what they're doing, you call it poverty," he says, "but poverty is because people don't share. Most of the wealth is owned by one per cent of the people and they don't share. They're greedy."

Western mental health approaches focus on our mentality, which is where we discern "the meaning of life." But Fabian says in order to be wholly well, people must tend to all four aspects of their being: mental, spiritual, emotional and physical. Known as the Medicine Wheel, which was adopted from southern Indigenous communities into Dene culture, this holistic approach is used to nurture Dene children from birth until they become Elders for their community. Those teachings, and the identities they instilled, were lost to Dene children forced to attend residential schools.

> We should acknowledge our despair so we can move together out of isolation.

Fabian teaches that our sense of belonging falls under emotions. Our sense of purpose is our physicality, discovered through our customs and skills. Hope, that precious commodity everyone craves these days, lies in our spiritual realm. "Once you take away spirituality, there's no hope. You take away emotions, there's no belonging. You take away mental, there's no meaning in life. You take away customs [physical], and you take away a sense of purpose."

Nature is my source of spirituality. I wrote my memoir *Voice in the Wild* about the guidance and magic the natural world offered up to me when I found myself, as a young apprentice of nature in the early '90s, living off-grid without phone service or a flush toilet in a fresh-aired, mostly frozen, often sunny world. We still pump water from our lake and drink it untreated.

Being outside, when it's not smoky, feeds me, but I'm further along in my apprenticeship. I see and feel and hear change. Just writing this line shifts the way my lungs feel — like they've hollowed out, my heartbeat ricocheting off shallow walls — a bit

of grief, probably, because no one wants to lose something they're in love with.

I ask Fabian if there are ways people can find their spirituality after he raised the spectre of an all-out war in the Middle East and his concerns about supply-chain interruptions for his remote reserve. People have become dependent on the local store, and the burned-out forests no longer sustain rabbits, once a dinner staple.

"Did you get up this morning?" he asks rhetorically. "When you get up in the morning, just be grateful that the Creator gave you another day. Say *mahsi,* thank you for giving me another day, and I'm going to do the best I can today for Mother Earth and for mankind. And spend the day doing that."

"So I can just build up my own personal spirituality based on gratitude and helping others and that will give me hope?" I ask.

"Yes, that's 100 per cent. It's about you, and it's about me. And you and I can only do the best that we can and hope the other people will see it and accept that it's a blessing."

* * *

THERE'S A GROWING chorus of voices beseeching us to transform and grow our hope muscles.

Psychoanalyst Jonathan Lear's *Radical Hope,* which explores what happens when a way of life becomes impossible — like that of Indigenous Peoples who depended on the buffalo — inspires us to imagine a "future goodness that transcends the current ability to understand what it is."

We should acknowledge our despair so we can move together out of isolation and into the joyful work of nurturing stronger communities and a better world. Because Business As Usual is eating itself alive.

Here's a warning. I appreciated warnings when I first locked eyes with literature about the collapse of post-industrial societies. Thankfully, they didn't stop me. "Not everything that is faced can be changed, but nothing can be changed until it is faced," wrote James Baldwin. So, proceed with caution: *this could trigger anxiety in those already concerned about the future and therefore may not be suitable for all audiences.*

My anxiety isn't just because carbon emissions are accelerating; so too are wars, authoritarianism, poverty, misinformation, food insecurity, and the catastrophic potential of artificial intelligence. Visions of *The Handmaid's Tale* dance in my head when economists lament the world's declining fertility rates at the *same time* as reproductive rights south of the border are viciously annihilated.

I feel split into two people: the dreary one on the couch trying to figure out why the world is unravelling when she thought it was only ever supposed to keep getting better — and "Nana," a joyful, sparkly new persona who floats inside a bubble of love with six cherubs who follow her like ducklings and smell like meadow.

When words like metacrisis, polycrisis and complexity theory are introduced to me through Australian author Sarah Wilson, who is writing a book on societal collapse, I start to come together.

If our complex modern society is going to collapse within the lifetimes of my grandchildren, or *anyone's* grandchildren, I want to be informed. I want to show up. A government think tank report on collapsing systems opens a path for me toward both. I share it with my brother. We talk about it.

That 2024 report, *Disruptions on the Horizon* by Policy Horizons Canada, delivers a disturbing top 10 list of "plausible" future threats. Ecosystems and biodiversity could collapse within just seven years. Most alarmingly, Canadians could experience a scarcity of critical natural resources, including water, within eight years. Democratic systems, healthcare and the ability to respond to emergencies could break down by 2030. Both Policy Horizons Canada and the World Economic Forum's 2024 Global Risks Report say misinformation and disinformation is the number one risk now.

Reliable information helps me regain my centre — because I never wanted to be placated or cheered up. I just needed things to make sense.

"Isn't it the moment of most profound doubt that gives birth to new certainties?" Czech dissident Václav Havel asked. "Perhaps hopelessness is the very soil that nourishes human hope."

Joanna Macy urges us to plant the seeds for the Great Turning, or what energy futurist Nate Hagens dubs the Great Simplification — the simpler, more sustainable world we could rebuild. That rebuild could learn much from Indigenous societies about reciprocity, setting limits and sharing. The Dene predicted the climate crisis in the late 1800s, and with that prophecy came successful efforts to conserve the biodiverse waters of Great Slave Lake and Great Bear Lake — not just for the Dene, but for all creatures and humankind.

This is the time for such magnanimity. Not a time to give up.

"We've never resuscitated a planet before," says Howard, who likens this point in history to the moment she and emergency room staff throw everything they've got into coaxing a dying patient's lifeforce back into the room. Howard is now part of growing efforts to have countries switch from growth economies to planetary health and wellbeing economies. Canada, New Zealand and Scotland are dabbling in this framework. That gives me hope.

* * *

I'M DRIVING into town to deliver the climate writing workshop, going unusually slow, collecting my thoughts. I look to my left just as a male mallard swoops toward my windshield. I see the bottom of his webbed feet. His mate carries on, momentum and updraft on her side. I wait for the splat.

Instead, he lands on his bum, slides to the end of the hood and sits there like a metallic blue-green hood ornament, legs dangling over the grill. Then, with impressive nonchalance he flies off and perfectly resyncs with his mate. They circle a couple of times before landing smoothly in a pond precisely as I drive by — like we are all part of an interconnected, choreographed dance, which we are.

Shortly after that, the loons return. Their reassuring wails flood me with gratitude. With providence, they'll be back again this year so my grandchildren can hear them, and we can take all the birds' lessons forward. On and on.

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Mark Simpson uses special meteorological balloons to launch his sensors into storms to better understand their inner workings.

INTO THE STORM

ALBERTA-BASED COMPUTER SCIENTIST MARK SIMPSON CAN DESIGN ANYTHING HE PUTS HIS MIND TO. SO WHY HAS HE CHOSEN TO CHASE TORNADOES?

BY **ALANNA MITCHELL**

AMID THE ALL-AMERICAN HEROES and villains that populate last summer's hit tornado movie *Twisters*, an outsider plays a key role. He is a meek, bespectacled British journalist who has come to Tornado Alley in the southern United States to write a story about a storm chaser played by the chiselled actor Glen Powell.

Powell's character is all swashbuckle and nerve in the face of imminent death. By contrast, the journalist's standout scene is when he stumbles from the backseat of a truck, post-tornado, and vomits. It's a classic film trope, pitting the plucky American against the faint-hearted Brit.

But while Powell's character is based on Reed Timmer, a real-life social media personality and arguably the world's most famous storm chaser, the British character has links to a lesser known member of Timmer's team. He is British-born, Alberta-based Mark Simpson, a shy, self-employed computer scientist and electronics designer who did what nobody else has ever been able to do: he invented an electronic sensor that measures the thermodynamics inside a tornado in three dimensions. He fired one of them into a ferocious tornado near Lawrence, Kansas, in 2019. The peer-reviewed paper about it came out last year.

Teams of scientists have been trying to peer into the inner workings of tornadoes for decades so they can better understand how they form and therefore how to predict them. The ferocious windstorms kill dozens of people a year in the United States and Canada, the top two most tornadic countries in the world. Damages amount to hundreds of millions of dollars a year. The stakes are high enough that researchers are trying to figure out whether climate disruption, which is generally increasing severe weather, will make tornadoes more frequent or stronger.

But getting information from *inside* a tornado is a notoriously difficult task. Much of the current data comes from mobile radars probing them from outside, from devices planted on the ground in the tornado's path or from computer and lab simulations. It's dangerous to get close enough to a tornado to launch something into it. Plus, tornadoes are so violent that they tend to destroy equipment placed inside them. So, despite having access to money from government agencies and university laboratories, other scientists couldn't work it out.

Simpson did it on his own from his Alberta home. And he did it with no university affiliation, in about a month, from scratch, on the cheap. Each sensor costs $400.

"I mean, he's just definitely a genius," says Timmer.

Simpson can not only build beautiful hardware but also write elegant code to process data and images and make the tool intuitive to use. Being good at just one of those tasks is uncommon and valuable.

So who is this guy? And why tornadoes?

SIMPSON AND I are in his much-dented red Ram 1500 truck, racing down an Alberta highway, peering at the prairie sky. The truck is a gadgeteer's paradise kitted out with instruments — many of which Simpson built or designed — to measure humidity, temperature, dew point, barometric pressure, wind speed, wind direction, lightning strikes, hail, atmospheric gravity waves and even infrasound waves too low for the human ear to detect. Simpson's brought along a tank of helium, a bunch of his tiny tornado sensors packed in high-density, construction-grade foam and specialized meteorological balloons that can take the sensors more than 21,000 metres into the air. Plus, of course, the usual battery of computers, phones, cameras, drones and other essential modern-day scientific field gear.

This is our second day chasing tornadoes. It's mid-July, toward the end of what is typically a month-long tornado season in Alberta. We had been waiting for two things: a forecast of two or three days of potential storm activity and for the canola fields to bloom, because storms feed on moisture the plants breathe into the air.

Finally, he texted me: "It's go time." I hopped on a one-way flight from Toronto to Calgary, and we chased until long after dark.

Today looks even scarier. Predictive radar and weather models are showing the possibility of big storms, maybe even supercells with rotating, upward-moving winds that could kick off a tornado. "It could be quite a reasonable day," Simpson says nonchalantly, his British accent snipping off the ends of the words. Meaning: spinning winds powerful enough to rip trees from the ground, flip cars, peel the roofs off buildings and even kill could be, even now, mustering their forces nearby in wildly unpredictable ways.

His plan is for us to get as close to those winds as possible and get one of his sensors into them, preferably from behind the storm. His successful effort in Kansas involved launching a rocket a mere 30 metres from a tornado whose winds peaked at 306 kilometres per hour. But here in Canada, fire regulations mean he has to use a helium-filled balloon rather than a rocket to carry the sensor into the heart of the action.

He points to a string of clouds along the Rocky Mountains west of Calgary. The base is good, he says, making silent calculations about how much wind energy, lift, moisture and instability the clouds have. Those are all ingredients a tornado needs. As he drives, his head pivots from the sky to RadarScope, an app that broadcasts real-time radar data and storm information, back and forth, back and forth. He's hoping to see a discrete radar blob with purple in the middle and maybe the distinctive hook shape that can indicate the air within and around the storm is starting to swirl.

We park at a gas station. The blistering midday heat punches us full in the body as we get out of the truck. Simpson, with neatly trimmed grey hair and wire-rimmed glasses, dressed in his

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PREVIOUS SPREAD: LEAH HENNEL/CAN GEO. THIS SPREAD, LEFT AND BOTTOM RIGHT: MATT MELNYK.
TOP RIGHT: LEAH HENNEL/CAN GEO

Clockwise from ABOVE: Simpson drives thousands of kilometres a year in pursuit of storms; a tornado forms near Carstairs, Alta.; a storm builds near Pine Lake, Alta.

uniform of baggy black sweatpants, a black T-shirt bearing Timmer's Team Dominator logo and hiking boots, sets up his tripod and aims his camera at the clouds forming this side of the mountains, a way to track their strategy.

Twelve minutes later, it's all over. He shows me the time-lapse images. The storm tried to grow and then fell apart. It's gone.

He turns back to RadarScope. Something is brewing in Saskatchewan, a day's drive away. He sighs. "I always wish I was somewhere else," he says. But then he brightens. It's early in the day, and a monster storm might still be on the horizon.

A PLOT LINE in *Twisters* revolves around the crush of amateur tornado chasers who gather, often in gas station parking lots, around the Timmer-esque male lead. A theme is that you don't need a PhD in meteorology to chase storms, just enthusiasm, a smartphone and maybe a YouTube channel to stream your efforts. In one scene, the Timmer character, surrounded by his "hillbilly with a YouTube channel" acolytes, shouts his catchphrase: "If you feel it, chase it!"

That part of the movie, much of which is scientifically fantastical, holds true. Citizen storm chasers have multiplied in the years since the original tornado blockbuster, *Twister*, came out in 1996. Starring Helen Hunt and the late Bill Paxton, the movie was a terrifying look at the violence of tornadoes and the lengths to which scientists will go to understand them. It charmed the world and got a couple of Oscar nominations.

Its success spawned a spate of other tornado programs, including the reality television series *Storm Chasers* (2007 to 2011), which stars Timmer (who actually does have a PhD in meteorology). And all that attention, plus the rise of social media and live-streaming and the accessibility of radar images, has spawned even more public interest

TEAM
DOMINATOR

TEAM
DOMINATOR
UP
SUBSONIC
INFRASOUND
OBSERVATORY
SEVERE WEATHER
PLEASE DO NOT

Clockwise from FAR LEFT: Simpson's chase truck is kitted out with weather instruments; an infrasound sensor to detect sounds below the range of human hearing; Simpson's tornado sensor (OPPOSITE TOP and FAR RIGHT) can withstand wind speeds up to 306 km/h; a tornado touches down near Carstairs, Alta.

in chasing. These days, research scientists sometimes have to cope with what they call "chaser convergence," when so many amateur spotters are following the same storm it can lead to dangerous traffic jams on dodgy back roads.

Even so, scientists give kudos to the citizen chasers for helping to spread information about tornado sightings. They say some amateurs are also helping to crack the mysteries of tornado science. Two stand out.

One was Tim Samaras, a renegade, pioneering, self-taught American tornado chaser who worked with academic researchers collecting data and publishing papers. In 2003, Samaras and his team put a turtle-shaped probe on the ground in the path of a tornado in South Dakota and collected information about its inner life, a breakthrough. Samaras died chasing a tornado in El Reno, Oklahoma, in 2013.

Another is Simpson. While much of the cutting edge of tornado science right now is focused on trying to understand wind speeds in the bottom 50 metres of a storm, where so much of the damage happens, Simpson's higher altitude sensor work is still novel, says David Sills, director of the Northern Tornadoes Project at Western University in London, Ont.

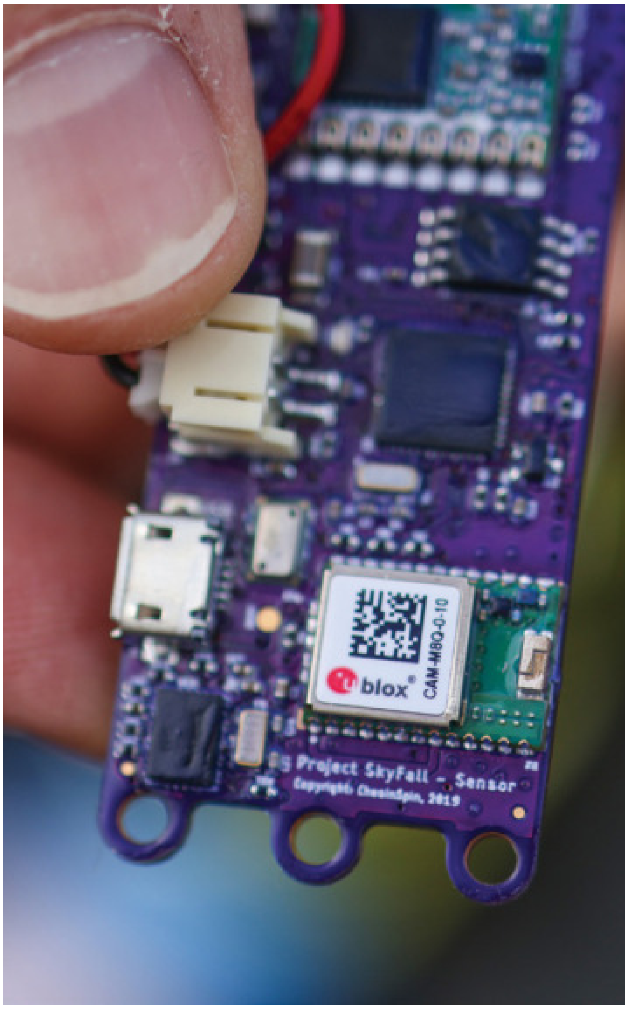
"It's no small feat. A lot of people struggle to see a tornado when they're chasing, let alone see it and launch something into it," Sills says. "It's not like in the movies where there's twisters all over the place. It's hard. It's like a needle-in-a-haystack hard."

Simpson had to find 12 tornadoes in order to get his sensor inside one, with a window of only a couple of minutes after the launch to get to safety. And he just keeps going. "You're not going to find too many researchers at universities or government labs willing or able to do that," Sills says.

It was the original *Twister* that sparked Simpson's interest in tornadoes. That, and the fact that in 1997 he left England and arrived on the Canadian Prairies, where intense tornadoes are far more common. Simpson's interest and expertise grew until, in early 2019, he and Timmer connected.

Timmer had long felt that a great missing piece of the tornado puzzle is what happens inside it. He'd been trying to launch miniaturized sensors into tornadoes since 2007, working with engineering companies and defence contractors, scratching together money from sponsorships and broadcast deals. No luck. Simpson's device, which weighs less than a robin, transmitted live, high-precision three-dimensional data every second from within the storm. When they finally recovered the device more than 50 kilometres from the launch site in a church in Leavenworth, they got even more detailed information.

Timmer showed video footage of Simpson's sensor success to Mark L. Smith, lead writer of *Twisters*. Smith researched the script in part by spending time with Timmer in 2021 in his



THIS PAGE: LEAH HENNEL/CAN GEO. OPPOSITE, CLOCKWISE FROM TOP LEFT: LEAH HENNEL/CAN GEO; MATT MELNYK

bespoke armoured vehicle, Dominator 3, chasing storms. Timmer also regaled Smith with tales about the British-Canadian genius who had cracked one of the toughest technological challenges of meteorology.

When Timmer watched the final cut, he saw Simpson's personality neatly divided between two characters: the timid British journalist and the smart science guy. "I'm certain Mark inspired one or both of those characters," he says.

SIMPSON AND I are still on the road. It's now late afternoon and, after the earlier fizzle, we're heading to Rocky Mountain House, south of where Environment Canada has issued a severe thunderstorm watch. Reluctant to spare the time to stop at a restaurant, he has brought elegant lunches for us: ham and cheese buns with homemade Dijon mustard, carrot sticks, grapes, plums, a water bottle spiked with mint from his garden. It's all tidily packed in flip-top containers, almost like the code he packs onto silicon chips.

He's continues to divide his attention between radar, satellite, forecasts and the sky outside the windshield. It's all mysterious to me. I look at the sky and see benign mist. He sees living forces of physics at play and can imagine where they might end up. He talks about them in almost human terms. Storms break out. Or they are disorganized. Or they have no capability of rotating. They die.

Simpson feels compelled to figure them out precisely because it's so fiendishly hard to do. "I just love learning and building things," he tells me. "When someone tells me something's impossible, that's when I generally try to do it." Then he laughs.

Earlier today, I was talking with Simpson's mother, Tessa, who lives in Airdrie, Alta., trying to get clues from her about why her son's brain works this way. A tiny woman nearing 80, she followed him from England a dozen years ago and often goes chasing with him. She loves it. "I think it's beautiful, a tornado," she says, adding: "I hope you get one." Simpson's chaser colleagues call her "Mark's bad-ass mom."

She says that, difficult as it is to explain, her son has always been able to do anything he tried. She shows me a beautifully crafted machine he made sitting on the table next to her television. It alerts her to the arrival of the northern lights, which she likes to watch, even matching the tint

MATT MELNYK

of the alert to the colour of the aurora. It's accurate 97 per cent of the time. Simpson recently developed a device that discovered a previously unknown binary asteroid (two asteroids that orbit each other), for which he earned a citation from the International Astronomy Union. "He's never actually not been able to do anything," his mother says, shrugging slightly.

Simpson's own conclusion is that his brain may work the way it does because of all the music he's studied. Before heading to the University of London in London, England, to study computer science, he won a scholarship at age 11 to study piano at the Royal Academy of Music there. His father, Douglas, was an accomplished pianist who studied with a student of Franz Liszt.

The music forced him to live out real-time patterns at speed, always thinking about what was coming. In a way, it was training for both computer coding and tornado chasing. Even now, he sees patterns everywhere. Everything has a mathematical and proportional relationship to everything else. These patterns spread themselves out for him like a map, and he writes them down in his memory.

It's now almost 6 p.m., and we're parked at a gas bar in Rocky Mountain House. The relaxed mood in the truck is shifting. Two storms are shaping up nearby, and one is developing hail. "It's quite a nice one. It could be taller but it's quite severe," Simpson tells me, pointing. He's thinking about how to launch a sensor into it with a balloon. We start driving straight toward it. There's a blotch of bright green on the radar that means winds are about 100 kilometres an hour within the storm. Simpson has become terribly alert.

Getting information from inside a **TORNADO** is a notoriously **DIFFICULT** task.

At 6:40, the storm develops into a supercell, the possible precursor to a tornado. It's got what Simpson calls, with grim satisfaction, a "large and decent core." It's straight ahead, just to our west, with mammatus clouds, which look like pouchy, pendulous udders, hanging from the underside of its spreading anvil.

Five minutes later, we're directly under it. We're driving toward the core, where the rain is heaviest, on tiny back roads, becoming swallowed up in it. My knuckles are white. Lightning is flashing. I'm not sure what our exit route is if the thing ramps up a bit more. Simpson says his worry right now is that we'll be struck by lightning, which would kill the truck's electrical system, stranding us. That hadn't occurred to me. Six minutes after that, he says: "So, have you ever seen golf-ball sized hail?" And laughs. Of course, hail like that could damage or even break apart the windshield. But that's not extremely likely, he says.

The core is straight ahead now. The front edge of the storm is yellowing pink. We can make out shafts of hail piercing through the vast clouds. The sky is the colour of crushed blackberries. We're driving past a bright-yellow canola field, all in bloom. Simpson has put the truck into four-wheel drive and reassures me that he has chains

A supercell thunderstorm (ABOVE) near High River, Alta. Blooming canola can actually fuel thunderstorms through evapotranspiration. Lightning crackles (RIGHT) over Red Deer, Alta.

for the wheels if we need them. These gravel and dirt roads can get greasy in such heavy rain. My stomach lurches. I feel like the British journalist in the *Twisters* movie.

And then, it's all but over. The moment for launching a balloon has passed. No tornado has appeared. Simpson pulls over to take pictures of the departing storm, noting that his instruments captured 97 lightning strikes. "It's a good storm," he says. Then: "I've seen better."

WE TOOTLE around for another couple of days on the lookout for a tornado but don't find one. Awful storms, pounding hail, but no twister. We run into about half a dozen other chasers. Some are involved with Team Dominator Canada, the group for which Simpson is lead scientist and assistant team lead. Most of the more casual chasers are not trying to get close, like Simpson is, or figure out what makes a tornado tick. They view from afar. For one thing, they don't want the vehicle damage. (One group drives a black Toyota 4Runner with the licence plate: OHAILNO.)

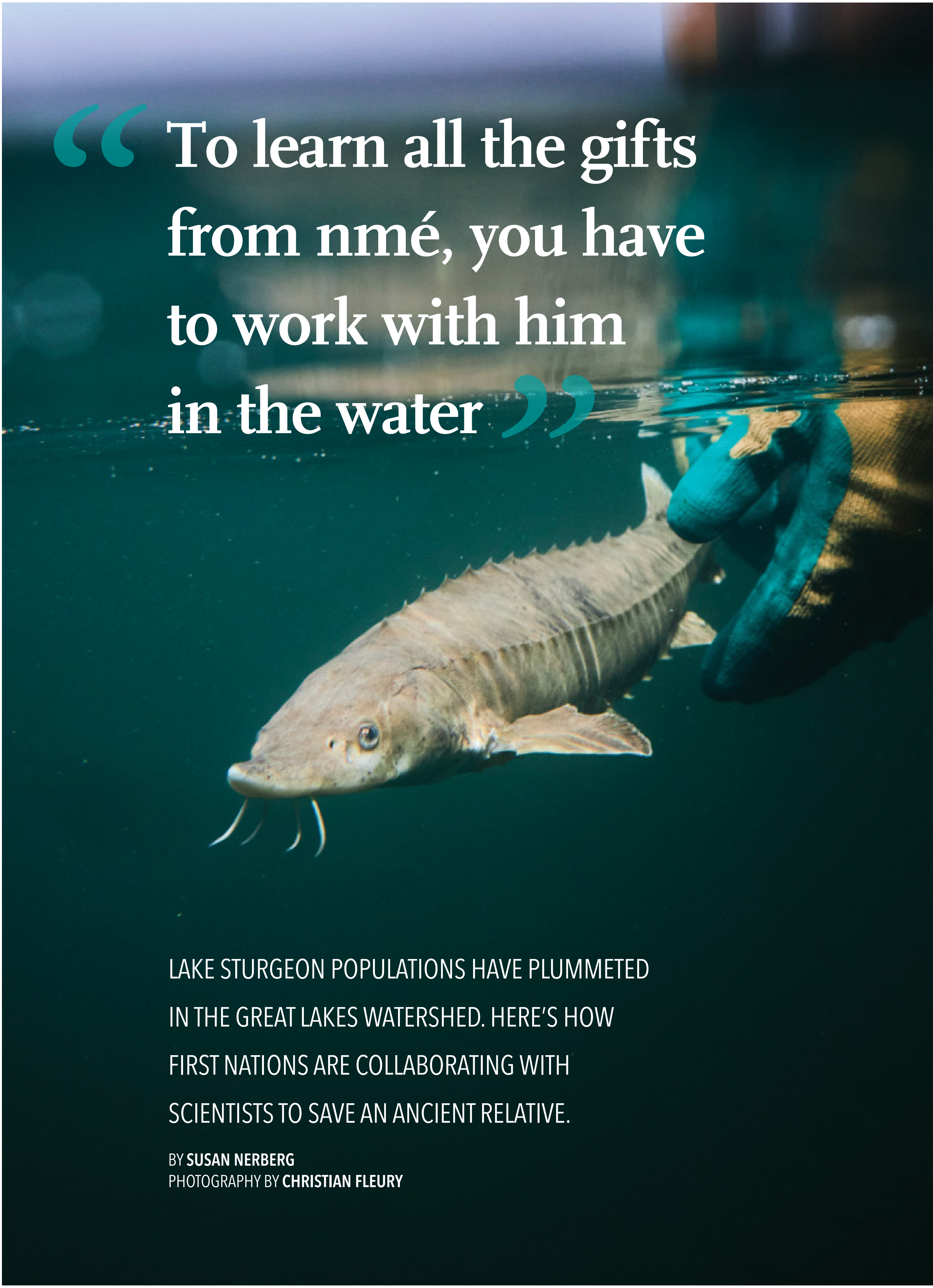
Simpson launches one of his sensors just east of Calgary to take an atmospheric sounding, the measurement of the vertical distribution of things such as pressure, temperature, wind speed and direction that Environment Canada and other meteorologists use to help create weather models. Most of the models, which are readily available on apps and websites, rely on data taken from airplanes and satellites. Simpson's balloon sounding is both localized and taken from the ground up, meaning it's apt to be more accurate. He posts it on social media as a reality check against those official models.

We spend hours tracking the balloon and its package through the sky to a field outside Drumheller, then hike a hill to retrieve it. Simpson has written an app to direct us on foot to exactly where the sensor is, guiding us seamlessly through the wildflowers.

The sun beats down on us. The prairies are singing with life. It's a far cry from the violence and uncertainty of the storms we've been chasing. I can see why Simpson does this. He's identified a puzzle, solved a piece of it, and knows that he, and maybe he alone, can solve more. It's a mystery that his mind just keeps gnawing at, trying to tease out a way to be the first to gather a few more data points.

Simpson's goal, and Timmer's, is to launch multiple sensors into the same tornado, an even more difficult feat than what they've already done. Could that lead to information that could save lives, develop early warning systems, lead to more windproof homes? Maybe. Or maybe they will turn their focus to the tornado's mysterious bottom 50 metres instead.

Finally, we're done. Simpson drops me off and drives away, weathervane churning in the wind. When we check in again earlier this year, he tells me he chased for many more weeks after we parted, far more than he expected, putting in 17,500 kilometres. He came close 20 times but, in the end, didn't see a tornado. Now, he's waiting for the canola to bloom so he can start the chase again.



“To learn all the gifts from nmé, you have to work with him in the water”

LAKE STURGEON POPULATIONS HAVE PLUMMETED IN THE GREAT LAKES WATERSHED. HERE’S HOW FIRST NATIONS ARE COLLABORATING WITH SCIENTISTS TO SAVE AN ANCIENT RELATIVE.

BY **SUSAN NERBERG**
PHOTOGRAPHY BY **CHRISTIAN FLEURY**

> "All of our stories are tied to this river. Once, there was a big celebration that lasted for days. A group of girls who were becoming young women were too powerful to take part in the ceremony. But they were curious and wanted to see what was happening. When they got close, the Water People came out to tell the young women not to eat the pink-bellied sturgeon, because the pink-bellied sturgeon are the people who have drowned in the river. They're our ancestors. Today, some families still won't catch pink-bellied sturgeon. In my community, if we get one in a net, we put it back in the water."
>
> ***–Brent Niganobe***
>
> *Elected Chief, Mississauga First Nation; member of the Sturgeon Clan.*
> *Story passed down from Elders Tom Daybutch and Doug Daybutch.*

If Chief Brent Niganobe were to lie down on the smooth rock beside Mississagi Falls, he'd be about as long as an adult lake sturgeon, not counting his braid, the visor on his trucker hat or the tassels on his loafers. But he stands tall as he shares about a time, not too long ago, when there were so many sturgeon you could walk dry-shod on their backs to the opposite shore of the Mississagi River.

The Mississauga First Nation have always gathered at these falls to fish and pass on stories and knowledge. They've lived along this river for as long as anyone can remember, canoeing down it to their traditional summer areas on the shore of Lake Huron's North Channel, where the river fragments into a bird-foot delta. They have ancient knowledge of lake sturgeon, or *nmé* in Anishinaabemowin. Nmé is their oldest existing relative, a pillar of their sustenance for millennia.

A living fossil, sturgeon have been around for more than 200 million years, a time in which they've barely changed. They still sport a shark-like tail fin and body armour that keeps them safe from predators: five rows of diamond-shaped scutes. The younger (and more vulnerable) the fish, the sharper the scutes. They have four barbels, whiskers they use to sniff out food; when they find prey, they pout their protrusible mouth and suck, effectively giving their catch the kiss of death.

The lake sturgeon is the largest and longest-living freshwater fish in Canada, with a historical extent across central and eastern Canada and the United States, from Hudson Bay to the Mississippi. Females roam for up to 150 years (scientists think they might live even longer); males have a lifespan of about 50 years. The megafauna of the Great Lakes, nmé can grow up to two metres long, with record catches topping four metres. Their size combined with their scutes should have made them invincible. But so much has changed around them, and so much force — more than their armour could withstand — has been levelled against these gentle, bottom-dwelling giants.

In the Great Lakes-St. Lawrence watershed, starting in the early to mid-1800s, colonizers ripped Niganobe's kin from their habitats and dumped them on the shore. Seen as pests that tore asunder fishing nets made to catch smaller lake trout, lake sturgeon were stacked like logs by the hundreds of thousands and set ablaze. Then came the logging boom, which destroyed spawning sites, burying them under silt and sawdust; and the caviar boom, when sturgeon eggs became a hot commodity. Hydroelectric power dams stopped sturgeon from swimming upstream to their spawning grounds; downstream, they killed eggs and larvae by flushing them away or drying them out as floodgates opened and closed. In all, lake sturgeon populations have plummeted to a mere *one per cent* of their pre-Confederation and pre-Civil War numbers. In not much longer than the lifespan for a female lake sturgeon, the Anishinaabeg's ancient relative was reduced to a shadow.

Thankfully, efforts on both sides of the Canada-U.S. border over the past several decades are finally making strides. Conservation measures — such as strict fishing regulations, rehabilitating cobble reefs for spawning, reducing pollution, creating natural run-of-the-river flows through dams and restocking baby fish — do work. And now that scientists and government agencies working around the Great Lakes are starting to recognize the value of First Nations and Tribal ecological knowledge, two-eyed seeing and data collection has the potential to rewrite the lake sturgeon conservation story.

For the Mississauga First Nation, this approach is fairly recent. Back in the 1990s, the nation, along with the Anishinabek/Ontario Fisheries Resource Centre, started their own sturgeon studies. They felt the Ontario government was doing a less-than-stellar job managing the fisheries. "They weren't on the land, they didn't do any field work and had no true data [from here], only data from elsewhere," says Keith Sayers, director of Mississauga First Nation's lands and resources department. So, to fill in the scientific knowledge gaps, the nation took data collection into their own hands.

More recently, in 2023, Mississauga First Nation launched a collaborative sturgeon tracking project in the Mississagi River with scientists from Mount Allison University, the Ontario Ministry of Natural Resources and Forestry, the Anishinabek/Ontario Fisheries Resource Centre, Fisheries and Oceans Canada and others. The nation brings multi-generational, on-the-land observations of nmé and its habitat — a culture-based ecosystem view. They know scientific methods can add the fine-grained data needed to ensure nmé will be around seven generations from now. And Mississauga First Nation is one of many nations around the Great Lakes-St. Lawrence watershed adding a new chapter to their rivers' stories — and to their continued relationship with nmé.

> **“When I was young, we didn’t talk about conservation. But because fish, including sturgeon, has always been an important source of food and medicine for us, we’ve always been careful not to catch more than we need. I was in my mid-teens when I caught my first sturgeon, using a pole with a short line. My grandpa once caught a sturgeon so big that, when he carried it on his back, its tail dragged along the ground. And my grandma, who made fishing nets for my dad, said that when the tiger swallowtail butterflies show up in spring, sturgeons would be swimming upriver to spawn.”**
>
> ***–Stan Nabigon***
>
> *Elder from Biigtigong Nishnaabeg, Heron Bay, Ont.; former warden at Pukaskwa National Park, Lake Superior*

Stan Nabigon may be retired from his 34 years with Pukaskwa National Park, but, like travelling sturgeons, he’s eager to get out on the water when an opportunity presents itself. So when the park’s ecology team packs a boat for a few days of sturgeon field work in June on the White River, Nabigon joins for the ride.

The survey site is five kilometres upstream from Lake Superior, below the Chigamiwinigum Falls. Old-growth cedars, perhaps as old as the oldest sturgeon in the river, prop up the sandy riverbank alongside balsam firs, white spruce and maples. The team — ecologist Chris Robinson, resource manager Tyler Ripku and technician Marissa Fugere — sets up a sturgeon processing station under a tarp: a two-metre cattle trough to hold sturgeons, a generator, an operating table and three different fish-tracking devices. Then they jump into a small boat and motor out to set nets, which they check the following morning.

Most fish wouldn’t survive being stuck overnight because they thrash around so much: they get tangled, their gills get smothered and they can’t breathe. But sturgeons tend to stay calm despite being caught, seemingly waiting for what might happen. Rarely is there bycatch: the team uses large mesh nets to let smaller fish swim through. Most net checks yield sticks (“stickerels”) and logs. But sometimes, the team gets lucky.

Ripku rushes sturgeon from the boat to the water-filled trough. Robinson and Fugere lift the fish in a sling, just

A tagged juvenile lake sturgeon (PREVIOUS SPREAD) is released into Lake Superior; Stan Nabigon (OPPOSITE) joins for the ride on the White River (LEFT).

long enough to record its weight. Back in the water for oxygen, then quickly up on a board to measure its size. Robinson holds the fish steady — sturgeons have a powerful tailkick — while Fugere runs a scanner over the back of the head to check for a tracking tag. Finding nothing, Ripku inserts a PIT tag (like a microchip) and a spaghetti-thin Floy tag with an ID number. This way, growth and movement can be charted over time.

This study, which started in 2023, is part of Parks Canada research on vulnerable, threatened and endangered species. Nabigon and others from the area always knew sturgeon were in the White River, even if their overall numbers in the Great Lakes-St. Lawrence watershed had declined. When sturgeon became listed provincially as a species of special concern in 2008, no sturgeon population survey had been done on the White River. So in 2010 the Anishinabek/Ontario Fisheries Resource Centre, the Biigtigong Nishnaabeg and Pukaskwa researchers struck up a collaboration, tagging 45 sturgeons with radio telemetry implants. They learned the White had one of the most abundant sturgeon populations in the Great Lakes.

The main objective now is to catch adult fish and equip them with acoustic telemetry tags to track their movement. “We want to know how much time they spend here and when, so that we can create a general idea of how they use different areas in the park,” says Robinson. “With that data, we can develop conservation measures, like limiting activity at or access to certain areas at certain times, for example during spawning.” The telemetry will also show how the fish in White River fit into the larger Great Lakes sturgeon-conservation puzzle.

Robinson, the “sturgeon surgeon,” takes a deep breath and sits down beside the upside-down fish in the trough, its snout and gills underwater. After palpating the sturgeon’s abdomen, Robinson injects a local anesthetic, waits for it to set in, then cuts an incision just long enough to insert the pinky-sized tag. Three stitches and a wound cleanup later, Ripku lifts the sturgeon out of the trough, cradles it and carries it to the river. He bids it farewell and puts it back in its element. For the next seven years (the tag’s battery life), the tag sends signals that are picked up when the sturgeon passes within range of the park’s 21 acoustic receivers or any one of the hundreds installed in Lake Superior or the wider Great Lakes. Individuals can be tracked over time, creating a continuum of lines on a map that, if sturgeon are allowed to thrive and reproduce, could come to resemble family trees with roots in different habitats.

Pukaskwa’s ecology team knows it pays to collaborate with the Biigtigong Nishnaabeg. Nabigon’s way of knowing the land and Robinson’s methods of reading it overlap like the lines on a telemetry chart. Put together, it’s not just an image of lake sturgeon: it’s about the ecosystem the species lives in. Seeing it from both worlds is something lake sturgeon will need to survive.

Susan Nerberg is a Sámi writer and editor based in Montreal. Christian Fleury is a documentary photographer and filmmaker based in Montreal.

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> “When they built the locks in St. Marys River, that’s a very sad story. Our villages were all along the riverfront where the locks stand today. In 1836, we signed treaties in which we were forced to give up our land with threat of removal. We were able to stay along the shores of St. Marys until the 1850s when the land was required for the locks and then we were forcibly removed. They loaded people in wagons and burned the villages, everything along the shore. Some people were moved to Sugar Island, others scattered. This is an oral history that’s in my family; I’ve never seen it in history books. We, the original people, have been here since the end of the last ice age. Settlers came here 350 years ago. We have been here for 350 generations.”
>
> **–Cathy DeVoy**
> *Division director of language and culture,*
> *Sault Tribe of Chippewa Indians, Sault Ste. Marie, Michigan*

Cathy DeVoy’s retelling of the colonial onslaught against her people mirrors the erasure of lake sturgeon. Nmé and the Anishinaabe have co-existed along the rivers and bays of southeastern Lake Superior since time immemorial. But when the Soo Locks were built in 1855 and expanded in more recent history, sturgeon spawning sites in the St. Marys River rapids were dredged, substantially reducing the cobble reefs essential for sturgeon eggs and larvae. Nmé — like the Indigenous Peoples that offer it protection — was decimated by settler-colonial “progress.”

Sturgeon born around the time of the U.S. Indian Removal Act might still be swimming the Great Lakes. Would they remember the destruction? What would they think about the newcomers’ betrayal of an ancient kinship? Luckily, not far from the Soo Locks, young generations of sturgeon are swimming a new wave.

One such place is Goulais Bay, northwest of Sault Ste. Marie, Ont. — it may just be the greatest sturgeon nursery in the world’s largest freshwater lake. The embayment is the site of an annual population survey that targets juvenile sturgeon, those between ages three and 15. Lisa O’Connor, Tom Pratt and Bill Gardner, the research team from the Soo office of Fisheries and Oceans Canada, are returning for a week of gillnetting to add to their 14-year dataset that will help them project the future of sturgeon.

Navigating through dense fog, Gardner takes the team toward Goulais Bay. Although it’s the middle of July, it’s cold on Lake Superior, on the fast-moving boat. By the time Gardner brings the boat into the bay, the fog has

Fisheries and Oceans Canada researchers (OPPOSITE) team up with the Ontario Ministry of Natural Resources near Sault Ste. Marie, Ont.; a tagged juvenile (ABOVE) returns to the depths of Goulais Bay, where conditions are favourable to support the food sturgeons like to eat: mussels, aquatic insects, crayfish and other fish.

lifted like a theatre curtain to reveal a play of blues and greens stitched together by pebble beaches.

Four nets per day, for four consecutive days, are set and pulled the following morning. Each net is 300 metres long, with different size mesh to capture sturgeons of varying sizes, or ages. “In some places, we see only aging fish,” says O’Connor, who’s swapped her tuque for a cap with an embroidered sturgeon.

The best way to find out exactly *how* old a lake sturgeon is — without killing it and taking its otolith, a bone in the inner ear — is by cutting off a small piece of the thick, spiny front section of the pectoral fin. At a lab in Sault Ste. Marie, researchers slice fin samples into fine cross-sections using a saw. Under the microscope, clearly defined rings represent years of growth, with one ring per year, like tree rings. They reveal the fish’s age and offer clues to its growth rate — a snapshot of how good a life the sturgeon was leading up to the time of sampling.

Would they remember the
DESTRUCTION?
What would they think
about the newcomers’
BETRAYAL
of an ancient kinship?

The youngsters that were caught and tagged in the earliest years of the annual survey might just be reaching spawning age now, says Pratt, because it takes at least 15 years for males and 20 years for females to spawn. And the conditions in Goulais Bay are favourable for supporting a healthy, growing population: the sandy, silty bottom is the right substrate for the food that sturgeons like to eat. Goulais River offers a long flow, giving larvae ample time to drift and learn to feed before they enter the bay. Pratt hopes that if the Goulais Bay population stays healthy and grows, some individuals might start to migrate to other areas in southeastern Lake Superior. Perhaps one day, the Goulais Bay sturgeons will fan out into the lake and start repopulating other shallow and food-rich bays like Whitefish and Batchewana, both Anishinaabe territories where sturgeon were pushed to near-extinction by settlers.

> **“Sturgeon is one of the best foods I’ve ever had. You can use every part of the body: its oils for candles, parts for regalia, for medicines. His name in Anishinaabemowin also means ‘prayer.’ He gave us one of the clans. He’s also part of our origin stories because the ball used in the Creator’s game, lacrosse, was made from sturgeon cartilage. All the body parts have gifts; inside the head is a sacred man with a feather. To learn all the gifts from nmé, you have to work with him in the water.”**
>
> ***–Dennis Carrick***
> *Member of the Bay Mills Indian Community, Brimley, Michigan; sturgeon spear fisher*

On dry land, Dennis Carrick’s day job includes tending to a village of honeybees and a herd of grass-fed cows at Waishkey Bay Farm in Brimley, Michigan. When Carrick leaves dry land for water to harvest sturgeon, it’s to exercise his treaty rights and practise his culture, spearfishing from a boat at night, using a light. He prides himself on providing a taste of this traditional food for Elders.

Carrick laments people catching the fish in shallow river waters when they come up to spawn. “We’ve put in years to re-create and protect natural spawning areas in rivers, so I don’t want anyone to walk in and ruin what took so long to bring back,” he says. “I don’t want to harass fish that are about to spawn. Hopefully, other Tribes will follow.” In the meantime, he takes Tribal people to lakes to show them how to find and harvest sturgeon. “They have a bony armour on the back of the head, so you have to spear them behind their gills,” explains Carrick. The reward for that precision goes beyond safeguarding culture. “Sturgeon tastes like grilled pork chop,” he says. “It’s delicious smoked, with salt or Cajun spices.”

Few people get to catch, much less taste, lake sturgeon. In Michigan, where the species is listed as threatened, a strictly controlled harvest is permitted only in certain inland waters, including Black Lake on the Lower Peninsula. Following the state’s Department of Natural Resources regulations, the 1836 Treaty Tribes (the Bay Mills and Sault tribes on Michigan’s Upper Peninsula and, on the Lower Peninsula, the Little Traverse Bay Bands of Odawa Indians, the Grand Traverse Band of Ottawa and Chippewa Indians, and the Little River Band of Ottawa Indians) can catch a total of six sturgeons per year — one sturgeon per Tribe per year, with an extra tag for one Tribe annually on a rotating basis. Non-Tribal anglers also vie for six sturgeon tags per year, given through a lottery for a winter spearfishing festival, The Shivaree, on Black Lake.

But harvesting on most lakes is not on the immediate horizon. The sturgeon population of Mullett Lake, Black Lake’s neighbour to the west, is too small to sustain even a minuscule quota. The solution? Restocking: raising baby fish in hatcheries and releasing them into the wild.

Restocking rivers and lakes became part of the statewide sturgeon

Hatchery-reared fish have been released into Mullet Lake, Michigan (OPPOSITE), since 2006. These fish come from the Black River facility; a sturgeon fingerling (ABOVE) at Little Traverse Bay Band Fish Hatchery, which stocks nearby Burt Lake.

rehabilitation plan in 1998. The Black River Sturgeon Stream Side Research Facility in Onaway — the self-proclaimed "Sturgeon Capital of Michigan" — opened in 2009, with hatchery-reared fish now released annually into the watersheds of Black Lake, Mullet Lake and four rivers from the Saginaw Bay watershed. Elsewhere on the Lower Peninsula, the Little Traverse Bay Bands and the Little River Band also rear lake sturgeon. While they and other Tribal hatcheries and the state-run hatchery in Onaway work independently, they all contribute to lake sturgeon rehabilitation.

"The purpose of rearing fish in the hatchery is to boost the chance of sturgeon babies reaching adulthood," says Doug Larson, a research assistant with Michigan State University, who manages the Black River facility, which keeps baby sturgeons safe until they're old enough to develop sharp, predator-deterrent scutes. "In the wild, only about one per cent of larvae make it. The other 99 per cent become snacks for other fish."

By the time research biologist Ed Baker arrives at the hatchery after a day of surveying sturgeon on Mullett Lake, it feels like a Turkish hammam. Tanks range in size and shape from small hobby aquaria to rain barrels, all containing moving water and tiny sturgeons. With pointy, upturned noses, hedgehog-sharp scutes and mottled, sand-coloured skin, they are simply very cute.

Each spring, staff, students and volunteers collect newly hatched larvae from the spawning site 3.25 kilometres downstream. The larvae are transferred to the rearing facility; there, safe from predators' maws, they grow into 15-to-20-centimetre-long fingerlings. At the end of the summer, they're tagged and released into the wild. Every year, 500 lake sturgeon each are released into Black Lake, Mullet Lake and the rivers of the Saginaw Bay watershed. Baker hopes, one day, hatcheries will become obsolete. "The goal, ultimately, is to remove lake sturgeon from the [threatened]-species list," he says.

Maybe there's reason for optimism. Fishing restrictions, habitat restoration and restocking have led to an increase in several sturgeon populations. In some regions, anglers can take part in sturgeon fishing derbies. Don Tadgerson, a commercial fisherman and Bay Mills member, scoffs at spearfishing as a sport. Spearing has been an important fishing method for his people, and the practice has cultural value. "But it's not sport; you're just standing there, waiting to spear the fish."

For Tadgerson, fishing is intertwined with Tribal identity. "I was up at 3:30 a.m. to smoke whitefish for a dip I make with Miracle Whip," he says with a glint in his Superior-blue eyes. Still, the offshore fisherman is no stranger to sturgeon. "We don't target them, because they've been protected for decades," he says. But two decades ago, he tagged 50 sturgeon that had accidentally ended up in his trap nets for a Bay Mills biologist who saw the bycatch as an opportunity to tag and gather biological data from the species in Whitefish Bay. As he swipes through photos on his phone — boxes of whitefish he's caught, the limitless lake, his boat, named *Mr. M$NE* as he "bought it off a rich guy" — he stresses the need for collaboration between Indigenous People and biologists *and* across the border because "fish don't see imaginary lines drawn by humans." Today, Tadgerson feels cautiously optimistic about the future of lake sturgeon. In Anishinaabe culture, the sturgeon is known as the chief, or king, of fish. "It probably can be, if it wants to," says Tadgerson.

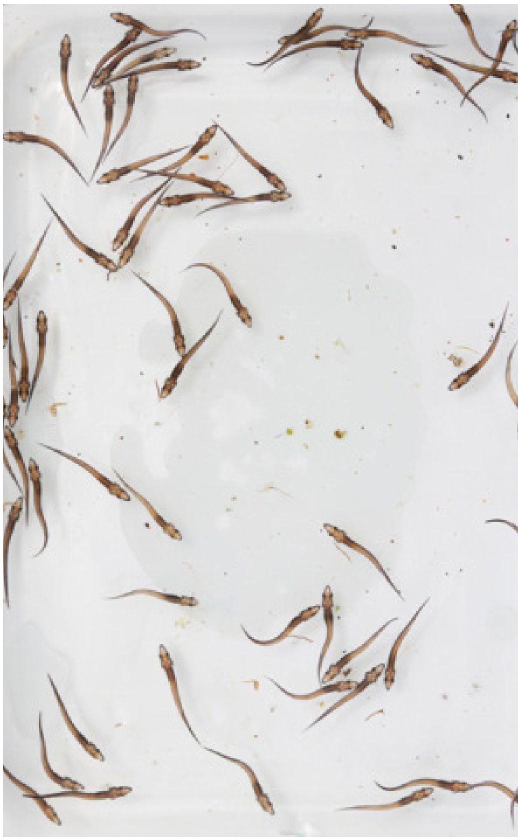
> "Fish will figure things out – the more we get out of their way, the better for them. We should stop referring to 'fish management' because fish manage themselves. Instead, we should manage humans to care better for the fish. We have an agreement with the Creator, who said we can harvest animals, but we have to be responsible and not take more than we need. Still, I'm hopeful for nmé because fish have intelligence, they have resilience, even though we don't give them credit for that. Lake sturgeon have their own knowledge systems. They're our oldest relative, but they're in trouble, so we have a responsibility to help them out – to help sturgeon be sturgeon."
>
> **–Kathleen Ryan**
>
> *Anishinaabe ecologist; investigator on the Mississauga First Nation's lake sturgeon research project*

O*gimaa giigonh*: the king, or chief, of fish. The philosopher, the mediator. The Anishinaabeg have always known that nmé holds ancient wisdom — how else would the species have survived the extinction of the dinosaurs and, more recently, the onslaught of colonial greed? For ecologist Kathleen Ryan — a self-described "fish nerd" who can talk for hours on end about kinship with fishes — protecting sturgeon is as much about helping a relative as it is about safeguarding Anishinaabe knowledge.

For Mississauga First Nation's sturgeon project, Ryan sat down with nation members with a paper map of the Mississagi River. They shared anecdotes and memories, saturating the map with colours, details and textures that show how, when and where people have interacted with nmé, and why. Did they catch them for food, medicine or ceremony? Are the fish bigger or smaller than before, are there more females vs. males, has their range changed?

Together, they created a living picture of the river as lifeline, a cultural chart. "Indigenous knowledge is the longest time series of knowledge we have," Ryan says. That granular, qualitative information enhances the quantitative data derived from scientific study. "The more Indigenous people are involved in research projects, the better for lake sturgeon."

Guided by the nation, biology professor Matt Litvak of Mount Allison University has been spending time on the water to map the subsurface topography and zoom in on sturgeon specifics — how many are there, where do they go, how old and what sex are they. Empirical data, to this day,



Tiny sturgeon larvae (ABOVE and OPPOSITE) from the Mississagi Delta; Anthony Chiblow (ABOVE, LEFT) returns the baby fish to their watery home. The goal, researcher Matthew McIsaac says, is to figure out the time between spawning and hatching, but also to get a sense for what larvae eat and which parts of the delta they use to get to Lake Huron.

still garners more attention from policymakers and academia than lived experience, but Ryan says, with both sets of information, the nation can develop its own management plan and use it to hold outsiders accountable. Litvak points to co-production of science as a question of ethics: collaborating to make sure nmé is around 200 million years from now. It's a big responsibility that includes tracking the littlest of sturgeons.

Shortly after the spawning season, in mid-June, Anthony Chiblow from Mississauga First Nation sets out on the delta in a boat, together with Matthew McIsaac and Kenneth McLaughlin from the Litvak Lab. It's a Friday morning, and the team is on its last larvae-catching expedition of the field season. Chiblow steers through zigzagging channels with riverbank vegetation so dense it's a bit like whizzing through canyons. Chiblow knows this water (he was seven when he started fishing salmon to give to Elders), but for outsiders, finding the way is a challenge.

Chiblow stops at the first buoy. McIsaac and McLaughlin pull up the sock-shaped drift net and pour the contents into a white dish pan. On a nearby island, the crew peers at what looks like seaweed soup and proceeds to remove bit by slimy bit to see if there are larvae. When they find them, they're sucked into a turkey baster and moved to a clear container.

The larvae are about 20 millimetres long. Some of them already show a hint of pectoral fins and barbels. McIsaac guesses they're about 10 days old. They dart about, so they're captured in photographs to be counted and measured later in the lab. After their mugshot, Chiblow takes them to the water's edge. He kneels, pouring them back into the river they came from. "Grow up and make lots of new babies!" he tells them.

Each of the babies released back into the Mississagi Delta has the potential to become part of new river stories — for Mississauga First Nation and the world. Sturgeon aren't just a resource to be managed. They're individuals who animate the same intricate weave that humans are part of. To rescue sturgeon is to open the door to new narratives. Nmé, if we help them live, can guide us along rivers and bays and lakes, and in so doing, help us chart a new course on the maps of our own imagination.

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Often called the "Galápagos of the North," Haida Gwaii is an archipelago where towering totem poles stand in ancient village sites, and rich marine waters support orcas, humpback whales, and the unique Haida Gwaii black bear. Travel aboard SV Maple Leaf or MV Cascadia, exploring dramatic shorelines, lush rainforests, and the living culture of the Haida Nation.

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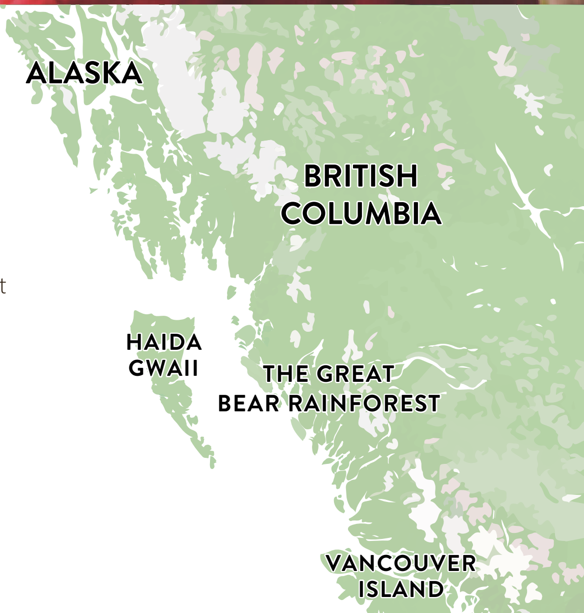
For an expert-led journey, join wildlife photographer Jenny Wong in the Great Bear Rainforest (Sept 6–13, 2025) aboard Cascadia, or explore Haida Gwaii with photographer Scott Forsyth (June 7–15, 2025), capturing the landscapes and stories of the coast.



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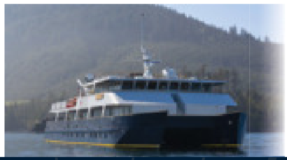

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The magic of the ST. LAWRENCE

A JOURNEY DOWN THE MIGHTY RIVER, FROM THE FRESH WATER TO THE SEA

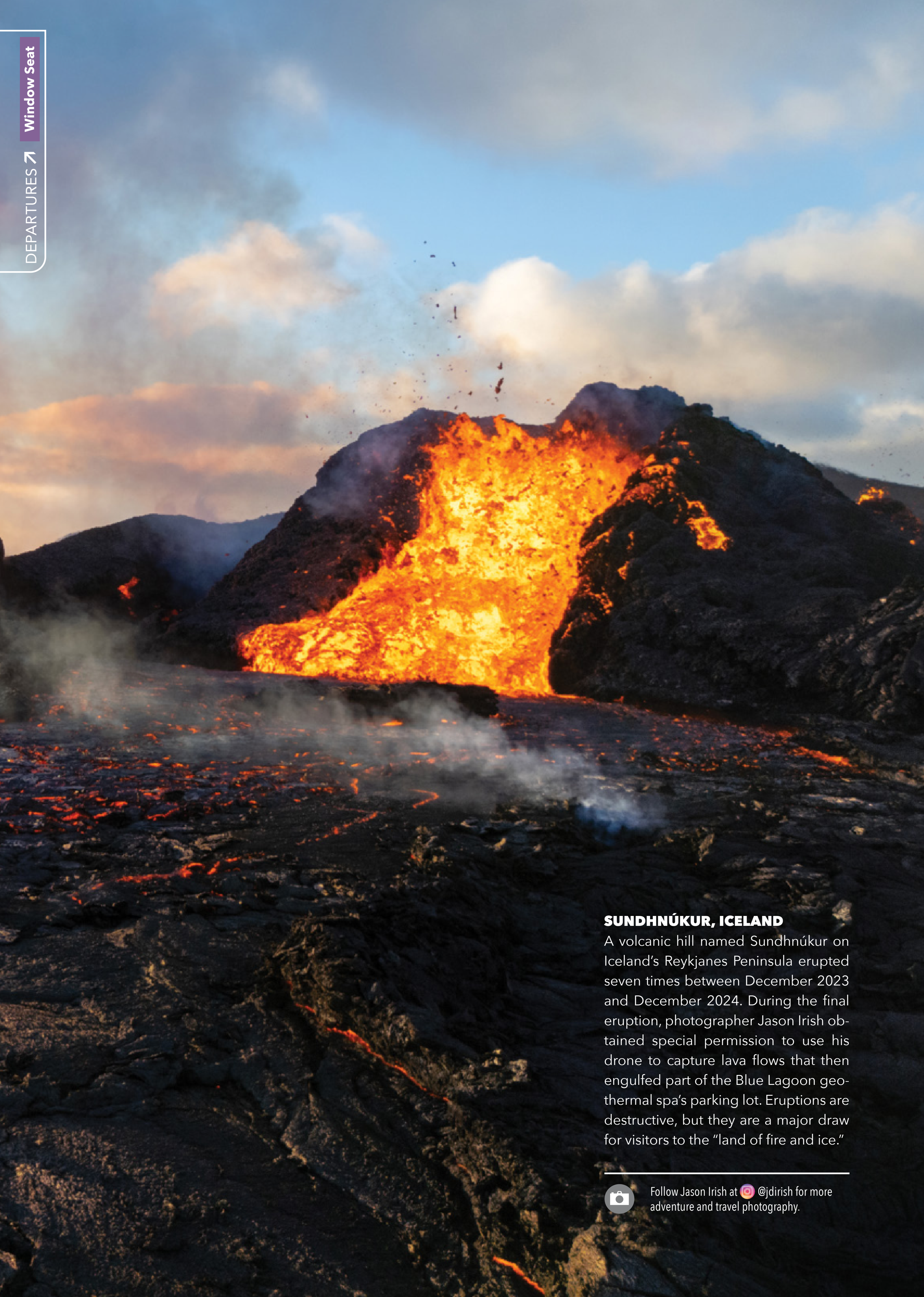
By Jamieson Findlay

p. **75** **PRAIRIE BEACHES**
SASK SUMMER RESORTS TO BEAT THE HEAT

p. **76** **FOOD AND FILM**
AT THE DEVOUR! FESTIVAL IN WOLFVILLE, N.S.

p. **78** **TREKKING PERU**
AN ALL-WOMEN QUEST TO MACHU PICCHU

JEAN-CHRISTOPHE LEMAY

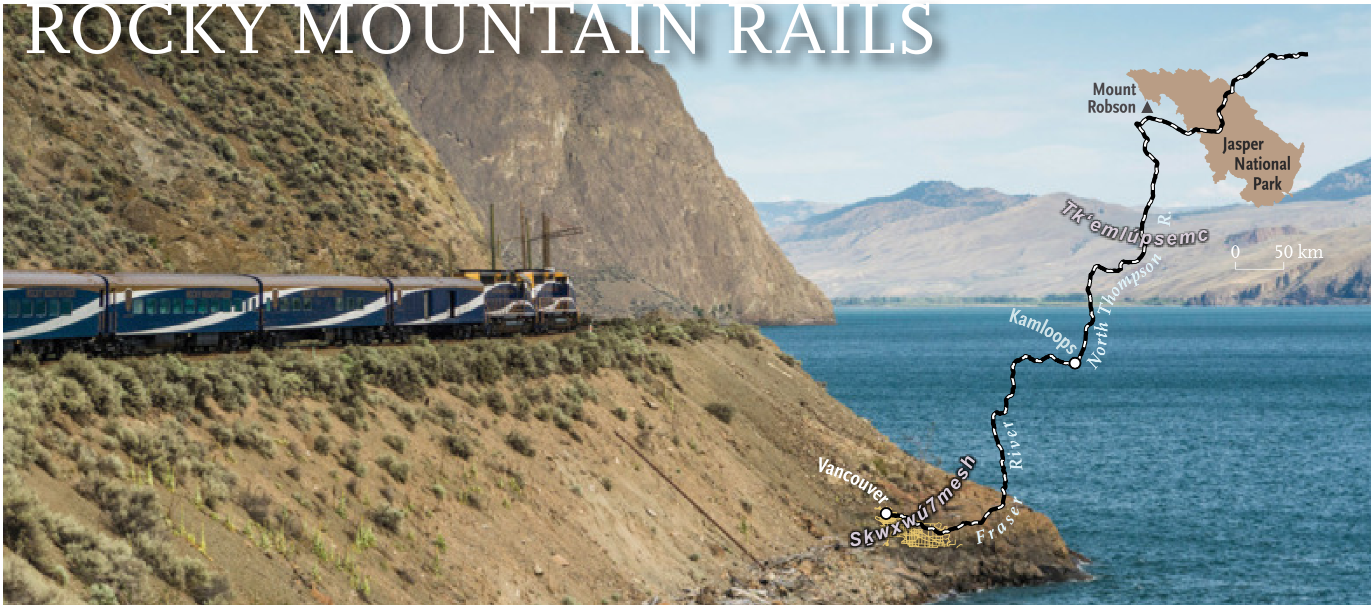


SUNDHNÚKUR, ICELAND

A volcanic hill named Sundhnúkur on Iceland's Reykjanes Peninsula erupted seven times between December 2023 and December 2024. During the final eruption, photographer Jason Irish obtained special permission to use his drone to capture lava flows that then engulfed part of the Blue Lagoon geothermal spa's parking lot. Eruptions are destructive, but they are a major draw for visitors to the "land of fire and ice."

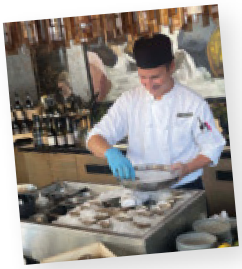
Follow Jason Irish at @jdirish for more adventure and travel photography.

ROCKY MOUNTAIN RAILS



If you want to get somewhere quickly, take an airplane. If you want to enjoy the journey, take a train. Rocky Mountaineer's "Journey Through the Clouds" is one of the most epic rail excursions in Canada. Encounter mighty rivers, postcard lakes, arid grasslands and striated peaks aboard this luxurious glass-domed train as it ambles from Vancouver to Jasper. – *Michela Rosano*

DAY 1 TREES AND TEACHINGS | 10 A.M. "People laugh when I say this is my good friend. We go way back," says Talaysay Tours guide Seraphine Lewis, pointing to a huckleberry bush under a towering maple tree. Make the most of your pre-train time and arrange a morning walking tour of Stanley Park, immersed in plants, trees and teachings from the land, rooted in Lewis's own Sḵwx̱wú7mesh (Squamish) and Haida knowledge.



SIP AND SHUCK | 3 p.m. Travelling is thirsty work, so make your way along the seawall to Arc Restaurant in the palatial Fairmont Waterfront for a glass of B.C. wine. If you're lucky, the happy hour features local oysters, like the sweet little Cortes Island gems from the Strait of Georgia. Follow that with a spectacular meal featuring honey from the hotel's rooftop apiary.

DAY 2 ALL ABOARD | 8 a.m. Board the Rocky Mountaineer and start your two-day passage. Gaze out at the verdant farmland of the Fraser Valley, and the surging, silty Fraser River while enjoying a gourmet breakfast of eggs benedict or smoked salmon on toast.

ABOUT THE TRIP

Rocky Mountaineer trips are offered from April to October. I took the eight-night Rockies Highlights version of the "Journey through the Clouds" itinerary, which includes two nights' stay in Vancouver, two days on the train, one night in Kamloops and a few nights exploring Jasper and Banff. The train travels during the day, providing breakfast and lunch, and Rocky Mountaineer arranges accommodations and some activities.

HELLS GATE | 1 p.m. At Hells Gate, where the Fraser heaves through a narrow gorge, the train enters more arid surrounds. The GoldLeaf Service upgrade gets you on a two-level car complete with a viewing platform and dining room where onboard executive chef Kaelhub Cudmore uses local ingredients inspired by the landscapes you're moving through.

VALLEY VIEWS | 6 p.m. Glide into the open skies and golden grasslands of the Thompson Valley surrounding T'kemlups (Kamloops), ancestral territory of the Tk'emlúpsemc, where you disembark for the evening. Explore the shops and galleries downtown or stroll along the Thompson River.

DAY 3 FORESTS AND FALLS | 8 A.M. Up with the sun and back on the rails, this part of the journey follows the North Thompson River through the Monashee and Cariboo mountains. Don't miss the view of Pyramid Creek Falls cascading in white tendrils down the mountainside.

JASPER ARRIVAL | 6 p.m. Everywhere you look, there's a mountain — and wildlife. Mount Robson, the highest peak in the Rockies, comes into view. "I see one!" rings out every few minutes as fellow passengers point out mountain goats and bighorn sheep perched on rock faces. If you're lucky, you may just see a bear come barrelling out of the trees. ❄

TOP: JAVIER FRUTOS/CAN GEO. OTHER IMAGES: MICHELA ROSANO/CAN GEO. MAP: CHRIS BRACKLEY

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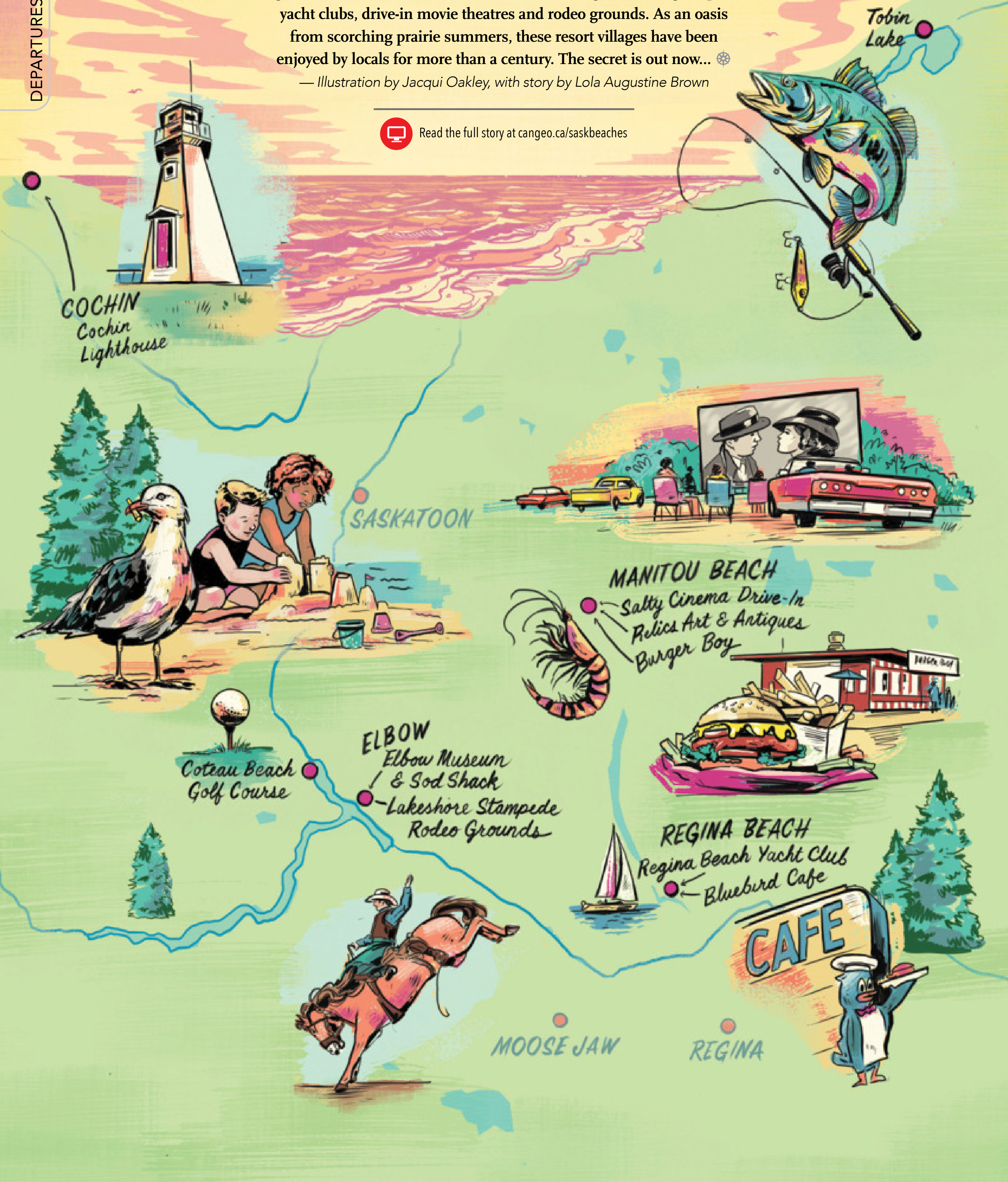
Little beach resorts on the prairie

IT MAY come as a surprise to some that landlocked Saskatchewan is a hub for beach resorts, with 43 resort villages on the shores of lakes that dot the province. These destinations offer white and golden sand beaches with activities from boating and fishing to spas, yacht clubs, drive-in movie theatres and rodeo grounds. As an oasis from scorching prairie summers, these resort villages have been enjoyed by locals for more than a century. The secret is out now...

— Illustration by Jacqui Oakley, with story by Lola Augustine Brown

Read the full story at cangeo.ca/saskbeaches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COCHIN
Cochin Lighthouse
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ELBOW
Elbow Museum & Sod Shack
Lakeshore Stampede Rodeo Grounds
REGINA BEACH
Regina Beach Yacht Club
Bluebird Cafe
CAFE
MOOSE JAW
REGINA

FILM FOOD

WOLFVILLE, NOVA SCOTIA

The film ends, and a bowl of pozole appears in front of me — deep red, cradling a helping of hominy. The Mexican stew is rich, salty and tangy, with a spicy kick that doesn't overpower.

The pozole is part of the Chefs & Shorts gala at the 14th edition of the Devour! food and film festival. Five films, five chefs, five courses.

With each course inspired by a short film, this signature event is "a real perfect cross-section of everything we do, in one space," says managing director Lia Rinaldo. The pozole is made by Edmonton chef Winnie Chen to accompany *The Ballad of Tita and the Machines*. The film's LA-based co-writer Luis Antonio Aldana is in the room and says the dish "was like a fusion of Asian, Mexican.... That's a staple dish for us, pozole. And it was delicious."

Every October, Devour! takes over tiny Wolfville, N.S., (population: just over 5,000) with workshops, events and films. Co-founded by chef Michael Howell and Rinaldo, a film industry lifer who grew up in the restaurant business, Devour! has gone from a low-key offshoot of the slow food movement to an international event attracting the likes of the late Anthony Bourdain.

It's a food lover's dream, with a side dish of films. Or a film lover's dream, with a good helping of food.

I start my festival experience with Demystifying Olive Oil, an event led by punk rocker turned olive oil evangelist Fil Buccino. In a room overlooking the Bay of Fundy, Buccino outlines the perils that conspire to degrade oil — heat, oxygen, plastic, sunlight — then leads us in a tasting. The first olive oil is fruity and peppery, while the second leaves me feeling like I've coated my mouth with Vaseline. Buccino's made his point: olive oils are not created equal.

Sticking with the Italian theme, I head to the movies for a drama about a star pastry chef in Rome whose life is in a rut and then catch a short film program called Immigrant Stories, whose highlight is director Anne Hu's moving short, *Lunchbox*, about a second-generation Taiwanese American woman's relationship with her mother and food.

ACADIA
DEVOUR THE FOOD FILM FEST

Offerings from the Chefs and Shorts gala (TOP LEFT and BOTTOM RIGHT); Acadia Cinema's Al Whittle Theatre (TOP RIGHT) on Main Street, Wolfville (BOTTOM LEFT).

MICHELLE DOUCETTE PHOTOGRAPHY; TOP RIGHT: DEVOUR! THE FOOD FILM FEST

Of course, Devour! screenings come with free snacks — and we're not talking movie popcorn. Think delicate canapés, rich sirloin meatballs and lively, fruity sorbets.

The afternoon before Chefs & Shorts, I go behind the scenes at the local community college. Here, chefs and culinary program instructors Paul Thimot and Peter Dewar oversee students prepping for the gala. One carefully snips nasturtium leaves from plants picked that morning. Another painstakingly polishes mussel shells, while others prep potato dumplings for a traditional Acadian fricot.

Devour! isn't only about elevated foods though. On Saturday, locals and visiting festival-goers line up for the New Canadians Street Food Celebration, featuring $5 plates of Nepali momos, British sausage rolls, Filipino skewers and the runaway favourite: Rajasthani raj kachori chaat.

While it bills itself as the world's largest food and film festival, Devour! feels laid-back. Events happen within a small, walkable area near the main street. Directors and chefs don't just come for their events and leave; many stay on, joining regular attendees.

I close out my Devour! experience with an Acadian lobster dinner (followed by a dance party). The Wolfville farmers' market has been transformed into an unpretentious canteen-style eatery, with rows of paper-covered foldout tables and plastic chairs. I sit with West Coast star chefs Julian Bond and Robert Clark. Chen pulls up a chair, and then Thimot, who steamed the 125 lobsters, joins us. The chefs have finished with their presentations, their dinners, their workshops. Now, they eat and talk lobster — how to cook it, why it's better on the East Coast, their favourite ways of sectioning it. Thimot even convinces Chen to try some of the squishy green tomalley from the cavity of a lobster.

"Acadian cuisine is comfort food," says Thimot. "It's like a big warm hug."

And that seems like a fitting note on which to end the festival. ❁

— *Philip Moscovitch*

DIGITAL

For even more travel stories, reviews, guides and videos visit **cangeo.ca/travel**

CHOOSE CANADA

With a trade war in full swing and the U.S. president musing about making Canada the 51st state, relations with our closest neighbour are not so neighbourly these days. As many Canadians turn their travel sights closer to home, Robin Esrock presents some uniquely Canadian alternatives to popular American destinations.
cangeo.ca/canadatravels

YES SHEF!

The culinary world has historically been a male-dominated space but a group of women in B.C. is breaking down gender barriers. At Vancouver's annual Yes Shef! event, writer Bianca Bujan chats with five top chefs about forging their own path in the industry – and encouraging more women to follow.
cangeo.ca/yesshef

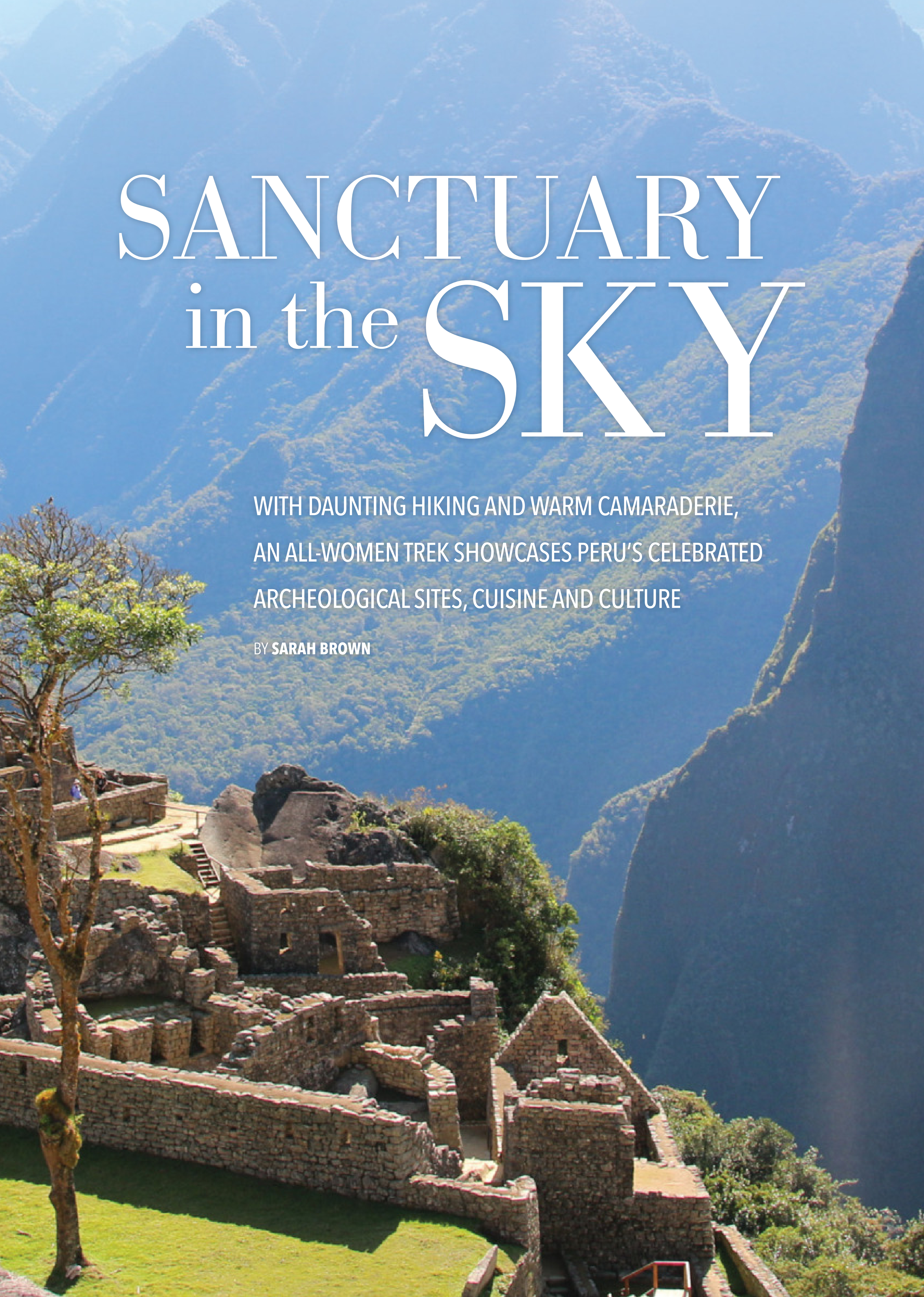
SIBLING RIVALRY

What happens when you put four thrill-seeking, competitive siblings in one of Canada's most outdoorsy and scenic places? An adventure worthy of the family photo album. Digital and travel editor Madigan Cotterill and her three brothers visit Banff for a pre-summer escapade, taking in peaks, caves and epic views.
cangeo.ca/banffitinerary

ARCTIC ACADEMY

Inuit have co-existed with Arctic wildlife for centuries. As the climate warms, generational knowledge is integral to preserving Arctic biodiversity, and a collaborative approach is the only way forward. Journey through the Northwest Passage with Adventure Canada and learn how hunters and artists are at the vanguard of northern research.
cangeo.ca/northwestpassage

ROBIN ESROCK. BOTTOM LEFT: BIANCA BUJAN. OTHER IMAGES:
MADIGAN COTTERILL



SANCTUARY in the SKY

WITH DAUNTING HIKING AND WARM CAMARADERIE, AN ALL-WOMEN TREK SHOWCASES PERU'S CELEBRATED ARCHEOLOGICAL SITES, CUISINE AND CULTURE

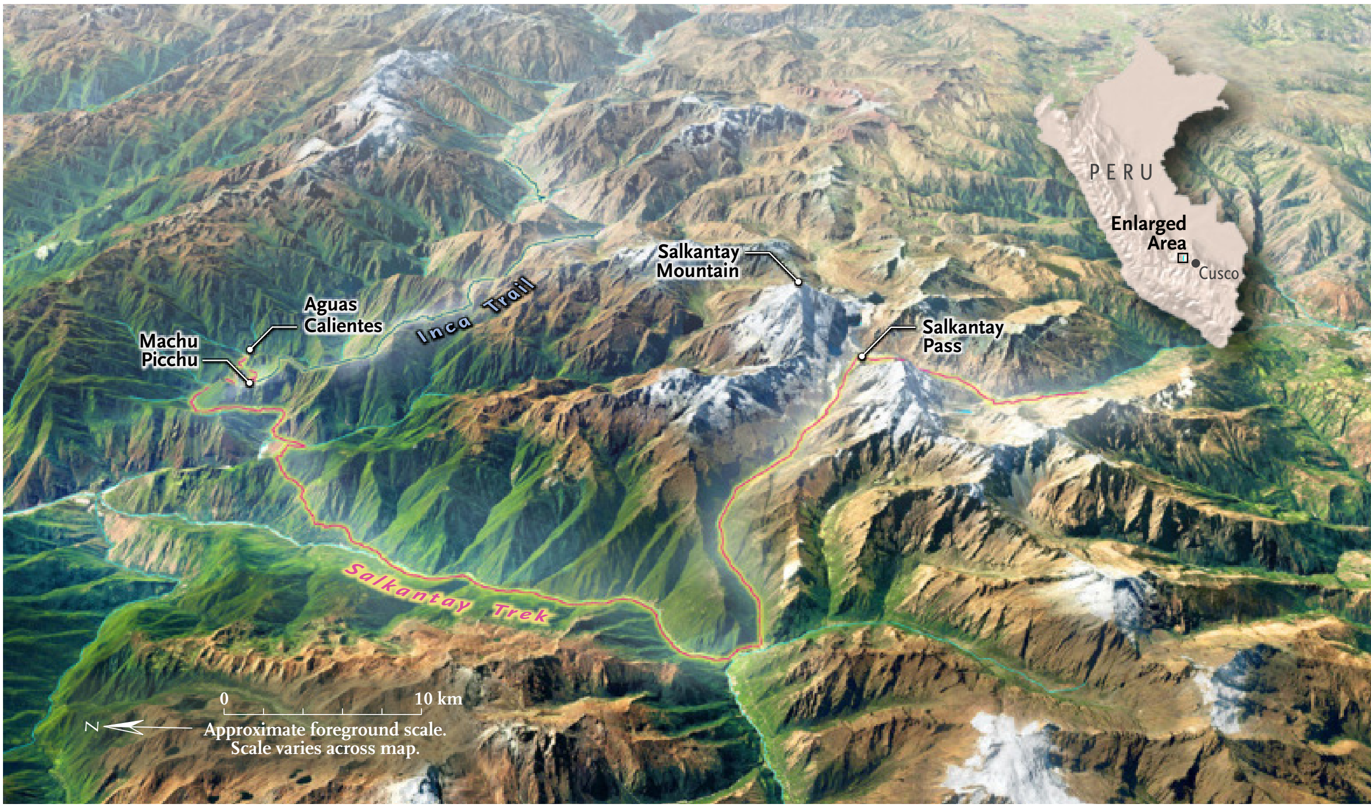
BY **SARAH BROWN**

TREKKING TO MACHUPICCHU
alpaca
EXPEDITIONS
www.alpacaexpeditions.com
#trekwithalpaca
THE GREEN MACHINE

HEART POUNDING, legs protesting, I lean on my trekking poles and take a few deep breaths, my gaze turned toward the snow-capped peak of Salkantay Mountain in the Peruvian Andes. My mind turns to thoughts of my mum, who passed away suddenly less than two months ago, and how happy she had been that my sister Jo and I were taking this trip together. She would likely have worried (but never said it aloud until we returned to Canada) while also being thrilled for us as we transported her to this enchanted place through sporadic texts and photos. It feels possible in this moment to be both buoyed and deeply sad. “You’ve got this; we’ve got this!” wheezes my co-trekker Bee as she struggles past. And we do.

Peru’s Alpaca Expeditions launched its first women-only tour to Machu Picchu last June. I was lucky to grab a spot on the inaugural run-through of this seven-day trek of a lifetime along the Salkantay Trail to the spellbinding Incan sanctuary in the sky. My mum ingrained in my sister and me the importance of women’s empowerment, and I know she would have loved to hear all about the lives and adventures of this group of 10 determined women — five trekkers and a team of five incredible guides, cooks and porters. I pop a coca candy into my mouth, take another deep breath of thin mountain air and continue ever upwards.

WORDS CANNOT do justice to the sheer scale and grandeur of the Peruvian highlands at the heart of the Inca Empire. At its height, from roughly 1438 to 1532 when the Spanish conquistadors arrived, the realm of the Incas stretched more than 4,000 kilometres along the Andes, from modern-day Ecuador south through Bolivia and northern Chile. In my readings ahead of the trip, I kept coming across the



Approximate foreground scale. Scale varies across map.

Alpaca Expeditions' first all-women trek to Machu Picchu (PREVIOUS and THIS SPREAD) sees trekkers hike the Salkantay Trail.

term "sacred geography" in descriptions of Machu Picchu and other Inca archeological sites. The idea makes perfect sense when I crawl out of my tent and into this magnificent mountain landscape. The muted light of the dawn slowly kisses one, then the next and the next in a seemingly endless series of emerald peaks; when dusk falls, those same jagged hills fade and disappear as the night skies take over, revealing a million stars and the Milky Way. Little wonder that this fantastical geography was so interwoven with the spiritual beliefs of the Inca, who incorporated their veneration of the natural world into their architecture — designing settlements like Machu Picchu in which the holy and the practical intertwine.

Sarah Brown (@otownbrown1) is a former editor at Canadian Geographic *and* Ottawa Magazine. *She's happiest hiking, birding and sleeping in a tent.*

Time and again on this trek, we hike up to excavated archeological sites to marvel at the ruins of temples cleverly laid out to capture the sun's rays on the winter solstice. Just steps away from these sacred buildings, a waterfall of agricultural terraces speaks to the quotidian. Designed to favour different crops at various altitude — corn and potatoes near the top, fruit trees at lower elevations — the terraces also incorporate sophisticated drainage and clever irrigation systems that funnel rainfall. Everywhere, the architecture is engineered to be both a part of the landscape and able to withstand the earthquakes and temperature swings that were a fact of life in the Incas' rugged empire. In between settlements, an extensive road network ran north to south — one main thoroughfare along the coast and inland paths that wove through mountain passes, with smaller trails linking communities. Remnants of these roads, including the famous Inca Trail to Machu Picchu, continue to be used to this day.

THE SALKANTAY TREK to Machu Picchu forces us into seven days of intense activity and close quarters. We're together 24/7, sharing meals and 10-hour hikes, bonding over blisters and broken nails. Our group of five trekkers establishes trust almost immediately, talking for hours that first day and night, sharing who we are and what drew us to Peru. My sister, Jo, is an environmental consultant and an avid hiker, while I'm a magazine editor who loves birdwatching; partners Bee and Connor are high school teachers in Texas with a penchant for fine food

PREVIOUS: SARAH BROWN/CAN GEO. CLOCKWISE FROM TOP LEFT: COURTESY JENNIFER BROOME; CONNOR BROWN; CONNOR BROWN. MAP: CHRIS BRACKLEY/CAN GEO
DATA CREDITS: GOOGLE EARTH PRO 7.3.6.10201, ACCESSED FEB 21, 2025. IMAGERY © TERRAMETRICS

and adventure travel; Jennifer, a solo traveller, is a meteorologist and travel journalist. Our ages range across three decades, and yet the friendships are easy, the camaraderie bolstered by long dinners and gruelling climbs whose success depends on each of us cheering one another forward when exhaustion sets in.

On the Alpaca Expeditions side of the equation, our guide, Marcela, is the only member of the all-female crew who speaks English. Quiet with an easy smile, she sits back and allows us to dawdle and bond over meals taken around a communal table, most often under a tent as the wind howls and the doors flap. The atmosphere is intimate and unrushed — tea, tea and more coca tea (coca is thought to help alleviate symptoms of altitude sickness) is poured as the conversation flows and stories are shared. Talk of gear and gradients quickly gives way to how we can recreate these amazing dishes at home. Marcela acts as translator when we coax the busy head cook, Marleni, out of the kitchen to quiz her about herbs and spices, or ask her to share recipes and tips.

Though the language barrier means we trekkers can't chat at length with the kitchen crew and porters, we learn small details about their lives along the way. Marleni is in her early 30s. A trailblazer in a male-dominated tourism industry, she comes across as serious but has a luminous smile when we compliment her on the meal. She was in charge of selecting and managing Alpaca Expeditions' first all-women crew and admits that she's finding it refreshing to forgo the usual machismo present in the kitchen. The work is challenging, she says, but she feels comfortable knowing her team is motivated by the same goal — working hard during the March-through-November tourism season to help support their families. Her crew comprises her younger sister Lorena, who is saving up to attend nursing school, Eulalia, a single mother of four, and Basilia, who has two children at home.

Each day, we trekkers marvel at how quickly Marleni and the porters bound past us on the mountain paths with massive packs on their backs, Lorena laughing as we clumsily attempt to keep up for a few metres before giving up rather than risk a sprained ankle. On the third day, as we cross the trek's high point — the snow-covered Salkantay Pass at 4,650 metres — the crew even finds time for an impromptu snowball fight before passing us again on the three-hour downhill to the evening's campground. By the time we arrive, our tents are up, and we have just enough time to set out our mats and sleeping bags before dinner is served.

Trekkers learn how to make ceviche (FAR LEFT), visit a women-run coffee co-operative founded by Mery (LEFT), meet alpacas and learn about weaving at a textile co-operative (RIGHT and MIDDLE LEFT) and enjoy delicious homemade meals (BELOW). Cooks and porters build a snowman beside the trail (FAR LEFT).

OVER THE NEXT FEW DAYS, there are plenty more ascents and descents, icy winds up high followed by the warmer breezes of the green cloud forest. There are waterfalls and bubbling streams, diving hummingbirds and delicately floating butterflies. Switchbacks along parts of the route are just wide enough for one, and we must scramble up the banks to make way for the trains of heavily laden horses also travelling these trails. “Quiet on set!” Jennifer yells at regular intervals. She has been contracted to upload regular weather and geography clips to the Weather Channel and needs us to stop chatting just long enough for her to record each spectacular video.

When we can walk side by side, Marcela answers our questions about the Inca Empire. We are sponges soaking up the history of this epic civilization as we trek through the heart of the Andes. But our guide is also keen to highlight how Peruvians live today. She points out a flourishing passionfruit plantation on one steep mountainside here, an avocado plantation by the side of the road there.

> This **all-women** trip has been a **rare gift** at a time when I needed it most.

And then there is the coffee. Hectares and hectares of coffee.

On the fifth day, we divert from the main trail to an organic coffee farm belonging to the Choquequirao women’s coffee co-operative. There, we’re greeted warmly by Mery, the entrepreneur running the show and our seed-to-bean-to-cup guide. She throws us some bags, and we get to work harvesting ripe beans.

Mery laughs gently at our unskilled attempts to “help.” Our hands-on tour — which moves on from picking to roasting and grinding — ends with us enjoying the freshest cup of coffee we’ve ever tasted. The tour feels like a truly authentic experience — it’s just a quick dip into coffee culture, but an immediate insight into how hard Mery and her team work. “Quiet on set!” comes the familiar refrain from Jennifer as she leans over a clay pot, giving an exaggerated eyeroll of ecstasy at the aroma of roasting beans as she stirs with one hand and records a quick explainer video on her phone with the other. I picture Weather Channel viewers across the United States racing out to their local coffee shops to demand Peruvian java.

OPPOSITE, CLOCKWISE FROM BOTTOM LEFT: CONNOR BROWN; SARAH BROWN/CAN GEO; CONNOR BROWN; SARAH BROWN/CAN GEO. THIS PAGE: SARAH BROWN/CAN GEO

Jo, Jennifer and Bee (RIGHT, from left) at the ceviche-making class. Head cook Marleni surprises trekkers with a cake (BELOW).

COOKING CLASS
alpaca

We each buy a few bags of this out-of-this-world-delicious coffee to gift to friends back home. Because the co-operative is small-scale, their coffee is sold to neighbouring villages rather than internationally, so it's our one chance to score some. Mery promises to send our purchases back to Alpaca Expeditions headquarters in Cusco to be picked up on our return; when you're hiking eight or more hours a day, you don't want to be lugging a couple of extra kilos of coffee in your backpack!

Speaking of Peruvian delicacies, I'm embarrassed to admit that until I joined this tour, I had no idea that Peru is internationally renowned for its rich culinary traditions, with foodie visitors from around the globe travelling here specially for cooking classes and to taste for themselves Peruvian dishes that blend Indigenous flavours with Spanish and Asian influences.

As we sit down for an open-air meal a few days into the trek, Marcela informs us that Marleni will be giving our group of food-obsessed hikers a lunchtime cooking class. High fives and cheers ensue as we scramble to clean off the picnic table and call dibs on tasks. Peru's national dish (and one of the country's most popular foods) is ceviche. The classic version features raw sea bass marinated with lime juice, onion, salt and hot chilies. But that's not exactly practical on the road, so Marleni has put together a vegetarian ceviche cooking class. Under her tutelage, each of us takes a role — zesting and juicing limes, chopping garlic, peppers, celery and onions, or peeling mangos. Crunchy Cuzco corn (a giant-kernel version) forms the base of our pop-up ceviche lunch. "I don't think the kitchen crew will be recruiting you for the team anytime soon," says Marcela wryly as she surveys my dicing skills.

Marleni's team has been spoiling us with incredible meals three times a day, working out of tiny makeshift kitchens in tents or at the back of basic huts, so we're humbled to realize through first-hand experience the level of care that goes into each dish prepared in such cramped conditions.

Welcome
To
Machupicchu
only
Women!!!

ON THE MORNING of the last trekking day, Marleni bakes us a beautiful cake. After lunch, the four crew members will leave us to head to their hometowns to regroup and get ready for the next tour, while we will move ever closer to our final destination of Machu Picchu. Even after witnessing Marleni's backcountry kitchen wizardry, we're not sure how she made a cake from a basic electricity-free shelter on a mountain plateau.

And then, before we set off on that final hike to Aguas Calientes (the closest town to Machu Picchu), we share stories — the cooks and porters speaking about how empowering it is to run the tour and show off their strengths, the travellers speaking about how special it has been to bond with their hosts and fellow hikers.

This all-women trip has been a rare gift at a time when I needed it most — a chance to experience awe and witness the sublime during a time of loss for my sister and me. To be encouraged and lifted by these women during this arduous trek through paradise feels perfect.

On the final day, we are up before dawn to grab the first bus to Machu Picchu, with the goal of being there for that perfect moment when the golden rays of morning sun flood this magical ancient citadel in the sky. Today there is no need for Jennifer to yell "Quiet on set!" For once, our group is silent, taking in the glorious remnants of the royal retreat spread out beneath the towering Huayna Picchu Mountain. I feel grateful to be here with Jo, Marcela, Jennifer, Connor and Bee. Though we may never meet again, we have been privileged to share so many stories and much laughter, bonded over tough climbs and otherworldly views — from strangers to family.

SARAH BROWN/CAN GEO

Sponsored by Arizona Tourism
for Canadian Geographic Travel

THE LURE OF SOUTHERN ARIZONA'S WARM WILDERNESS

5 places to enjoy hiking, history and wine, all within less than a day's drive of Tucson

At first, we come for t-shirt weather. Arizona's clear blue skies, daytime highs and spectacular sunsets are a reprieve for winter-weary Canadians. Then we go on a day trip or two and instantly find a favourite hiking trail, a tavern where we'll see our friends and a roadside diner with the best tacos this side of Mexico. We really don't want to leave and we can't wait to come back.

Let's do a little planning for our next southern Arizona adventure.

ORACLE STATE PARK

Less than an hour north of Tucson, Oracle State Park is a gem of a day trip destination with more than 38 kilometres of trails. Because of Oracle State Park's unique location skirting four bioregions, visitors can see 11 species of owls! Chances of spotting a great horned owl are good, while catching a glimpse of a Mexican spotted owl is rare — but a definite possibility. Plan to stay late because Oracle is officially an International Dark Sky Park, away from city lights.

BISBEE

If you're lucky enough to have a piece of Bisbee Blue in your rock collection, you might know something of the mining history of this city. Copper, gold and silver set the stage for success in the late 1800s, but it's the vibrant turquoise gem that continues to shine. Take an underground tour of the Copper Queen Mine with a former miner, then spend some time topside exploring the historic streets and neighbourhoods.

TOMBSTONE

The Town Too Tough To Die, made famous by Doc Holliday and Wyatt Earp, delivers on everything you expect including historic saloons, western wear shops and gunfight reenactments. And it has some things you might not expect, like the Murray Spring Clovis Site, one of the most important archeological sites used by early humans in North America. Book a stay at the Tombstone Monument Ranch & Cattle Company, where you'll be put to work as a true ranch hand, herding cattle and calves, riding and fixing fences, and checking wells.

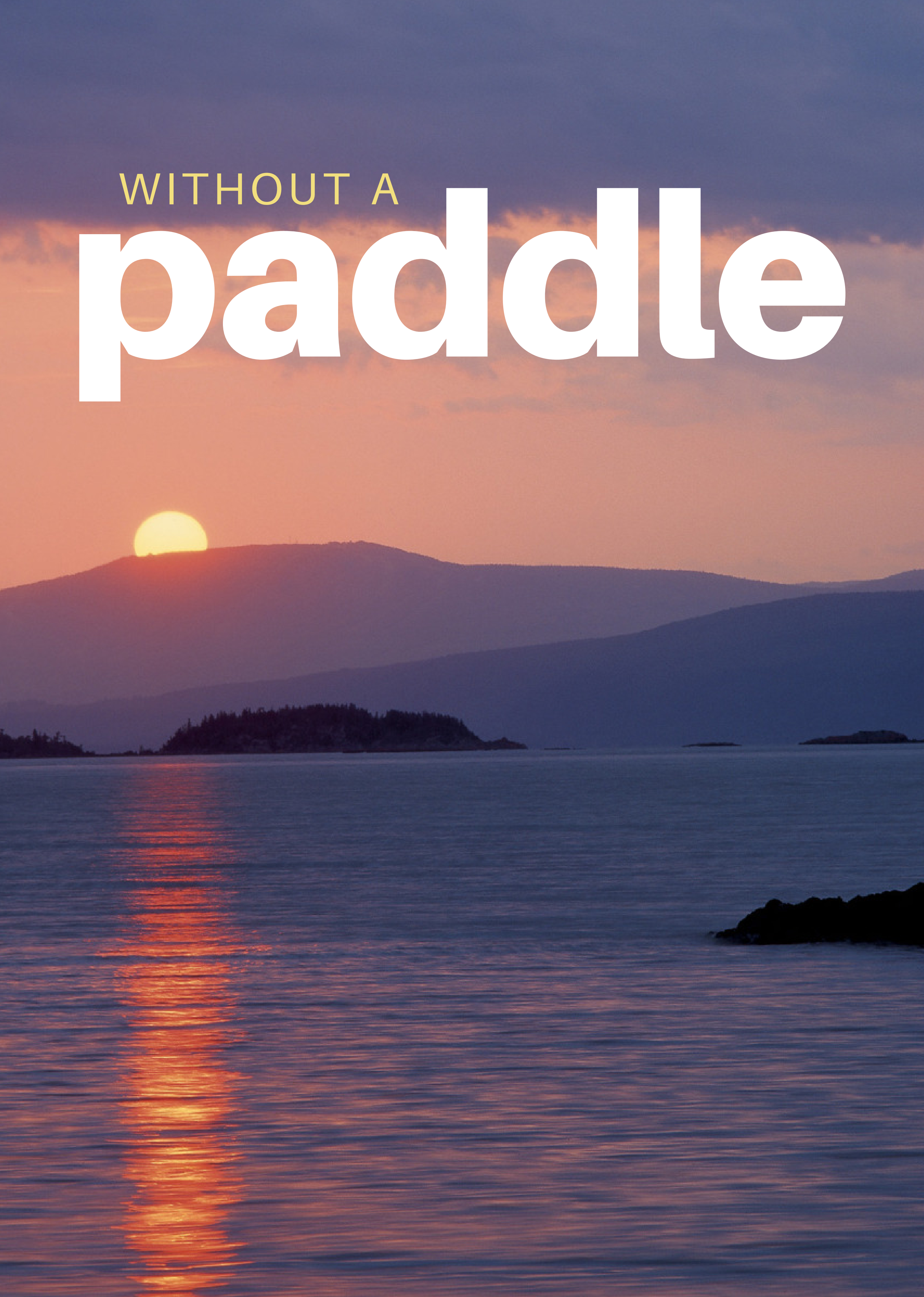
WILLCOX

Welcome to wine country! Willcox is the largest grape-growing region in the state with more than a dozen vineyards and wine tasting stops and two festivals every year. It's also a big attraction for birders, especially around the Willcox Playa wetlands, where an estimated 200,000 sandhill cranes spend the winter on this lakebed. Staying overnight? Spend the night in a Quonset — a domed structure — at Rhumb Line Vineyard and Lavender Farm, where the vineyard, olive grove and lavender field are right out the door.

CHIRICAHUA NATIONAL MONUMENT

The Chiricahua National Monument, also known as the Land of Standing-Up Rocks, is a collection of pinnacles, columns and spires — a result of violent volcanic activity. Experienced hikers can tackle the 12-kilometre Heart of Rocks loop to see some of the most distinctive formations in the monument. Or, take the scenic Bonita Canyon Drive to Massai Point for a panoramic view of this unusual landscape.

WITHOUT A paddle



TWO FRIENDS THINK, WRITE SONGS AND "SAIL" DOWN THE ST. LAWRENCE, FROM QUEBEC CITY TO TADOUSSAC – THEY HOPE

BY **JAMIESON FINDLAY**

NOW THAT IT'S ALL OVER, and we're back on land with reasonably dry feet, I can distill the whole experience into a single bit of advice: don't try to tackle the sea in a tame-water boat.

My friend Bill Barkley and I learned this lesson on the fifth day of our St. Lawrence adventure. We were motoring out from a little harbour town called Berthier-sur-Mer, about 45 kilometres downstream from Quebec City, on the south shore. Our boat was *Hepcat*, a five-metre-long runabout with a 20-horsepower outboard motor, used for duck-hunting and angling. On the far shore, mountains hung in the air, a soft membranous blue in the distance. The water was the colour of old green chert and clouded like crystallized honey. Once away from the sheltered marina, we encountered only modest waves — no "sheep" (*moutons* is "whitecaps" in French). We didn't know then that even modest waves would present a challenge for the low, flat-bottomed *Hepcat*. We bounced along for 200 metres. Then we slid lazily down into the trough of a wave, and the St. Lawrence poured in over the prow.

Crouching in six inches of water, I scooped furiously with the bailing can while Bill, at the wheel, turned the wallowing boat around. We returned to our marina berth under the stern eye of the harbour master, whose opinion of us as sailors, already low, had surely dropped several notches. A duck-hunting boat!

It had all begun in optimism and, I admit, some ignorance.

In spring 2024, Bill and I were looking around for a charity challenge to follow the one of the previous summer, when we'd walked the Algonquin to Adirondacks (A2A) Ecological Corridor to raise money for Nature Canada and the A2A Collaborative. Bill suggested an expedition on the St. Lawrence, adding that he had a boat — of a sort. Rashly, I proposed exploring the upper estuary, this time raising funds for Nature Quebec. Here, the river acquires another soul: salt water flowing in from the Atlantic Ocean mingles with fresh water from the Great Lakes.

And so we set out in *Hepcat* from the town of Portneuf, 60 kilometres west of Quebec City, under a long glide of blue sky, the river calm beneath us. *Hepcat* was loaded up with fishing rods, fenders, rain gear, a cooler, a toolbox, camping equipment, rubber boots, collapsible chairs, waterproof navigational charts and a small trolling motor with its battery. I dipped a finger in the water: yes, fresh. We were still in the fluvial or freshwater estuary, which runs from roughly Lac Saint-Pierre, near Trois-Rivières, to the eastern tip of Île d'Orléans past Quebec City. Moving east on the river, we'd enter the upper estuary in a couple of days and eventually be able to taste the sea.

On the clement water, *Hepcat* seemed to be doing fine. We saw tankers plying the channel and passed the red and green shipping buoys, some bearing a few cormorants. By mid-afternoon we had reached Quebec City and, having moored at the yacht club there, set out to chronicle the local ecology.

"Look at everybody walking around and thinking," remarked Bill.

I wrote this down, thinking it might find its way into a song I was composing. As a fundraising hook, I had undertaken to write a ballad about the St. Lawrence and so had brought my little travelling guitar on the boat. To inspire us, Bill's middle son, Liam, had already sent along a rousing shanty about our upcoming adventure, created using a song app (no instrumental or vocal input required):

Bill brews a magic potion
from berries wild and rare.
That grants them the power to
speak with creatures of the air.

The expedition didn't quite take us to such heights, but we did learn some things to put into a song. In particular, we learned that the upper estuary is the sea — in fact, it's the sea raised to the second power. And with the sea you get (in the words of the English writer Charles Lamb) "wild usages."

CLAUDE BOUCHARD/BONJOUR QUEBEC

Clockwise from LEFT: Jamieson Findlay (right) and friend Bill Barkley (left and BELOW) at Isle-aux-Grues, after they ran into trouble again with *Hepcat*; the St.Lawrence River at Quebec City; boats docked at Sainte-Pétronille on Île d'Orléans; Grosse Île and the Irish Memorial National Historic Site.

THIS PAGE: BILL BARKLEY; JAMIESON FINDLAY. OPPOSITE, CLOCKWISE FROM TOP: JEAN-FRANCOIS FRENETTE/BONJOUR QUEBEC; MATHIEU DUPUIS/BONJOUR QUEBEC; JAMIESON FINDLAY. MAP: CHRIS BRACKLEY/CAN GEO

THE WATERS MEET as galaxies meet, in a long silent intermingling. This begins to happen just east of Île d'Orléans, about 45 kilometres downstream of Quebec. Since salt water is denser than fresh, two layers form. The salt content gradually increases as you travel east toward the village of Tadoussac, 175 kilometres away.

Other things happen around Île d'Orléans, too. The estuary widens. The mountains come right down to the north shore. And the moon, holding the reins of the river, gives them a vigorous twice-daily flick.

That's what tides are, of course: the movement of water caused by the gravitational pull of the moon (and, to a lesser extent, the sun). As the moon circles the Earth, its gravitational force causes the sea to bulge out. Think of the sea as a duvet; if you pull it up at one point, its opposite edge will draw in from the corner of the bed. Tides are present well upstream of Quebec City, but it is in the estuary that they become truly impressive, rising and falling as much as seven metres per day.

All these conditions add up to the sea, but for those first calm days the estuary concealed its character.

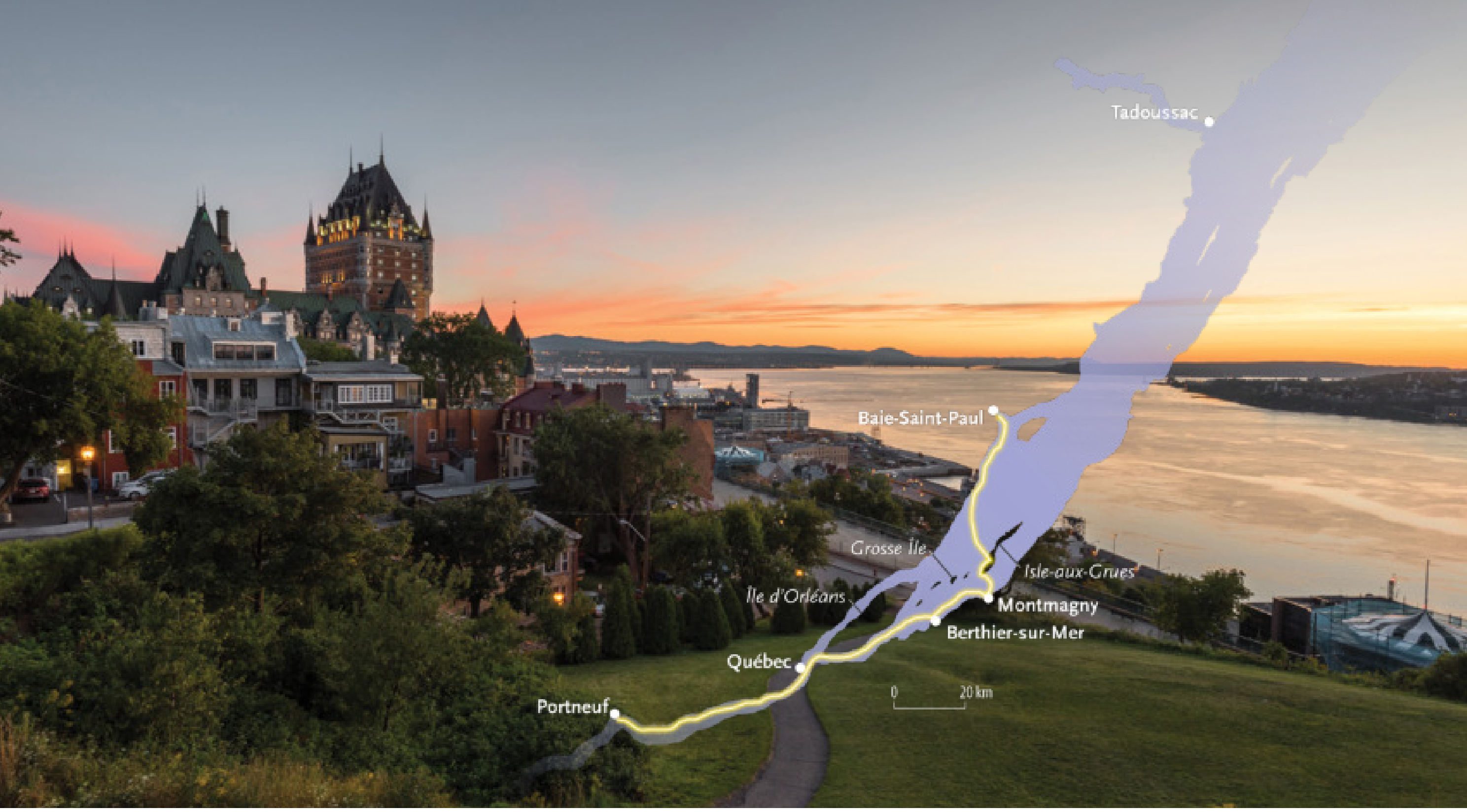
We took a leisurely few hours to motor from Quebec City to the aforementioned Berthier-sur-Mer, and the next day took a ferry from the harbour to Grosse Île, one of 21 islands that form the Isle-aux-Grues archipelago. Now a national historic site, Grosse Île served as the country's main immigration gateway and quarantine stop from 1832 to 1937. It is a lovely place to take in a bit of history, with its rocky shorelines on the north, tidal flats on the eastern side and fledges of fir, maple and oak all over.

"Ever see any whales from here?" I asked one of the Parks Canada guides.

"We hope we don't see any," she replied, "because if we do, it means they're lost." Rarely, whales get disoriented and have made it as far upstream as Montreal, but the voyage doesn't often end well for them. Fresh water is not their element.

We ended up staying another two nights in Berthier-sur-Mer because of the weather. The first day was rainy, the second breezy (that was the ill-fated day we almost swamped.) The third day was also breezy, but Bill suggested that if we stuck close to the shore, we could avoid the worst of the waves. I figured that had its own risks. Sure enough, half an hour out, our propeller scraped bottom. But we made it 18 kilometres downstream to a town called Montmagny, where we moored in a small marina and raised the engine to have a look at the propeller. Some "wild usages" were evident on one of the blades.

"How far are you travelling?" asked an old salt, as Bill filed down the nicks



on the propeller blade. A young salt was looking on.

"Tadoussac, we hope," I replied.

Both salts laughed together, as if they had rehearsed it.

"In *that* boat?" said the older one.

We ourselves were beginning to wonder how far *Hepcat* would take us. If we wanted to reach Tadoussac, or even Baie-Saint-Paul, we had to get ourselves over to the north side of the estuary — which now seemed like a major undertaking. And before we did that, we wanted to stop at Isle-aux-Grues, eight kilometres out from Montmagny. Even *that* seemed like a major undertaking.

Jamieson Findlay is a storyteller and grant writer at Nature Canada. His most recent novel is Pilgrims of the Upper World.

"I haven't made up a will," said Bill to me at one point, thinking aloud as he often did. "I guess you'll get the boat."

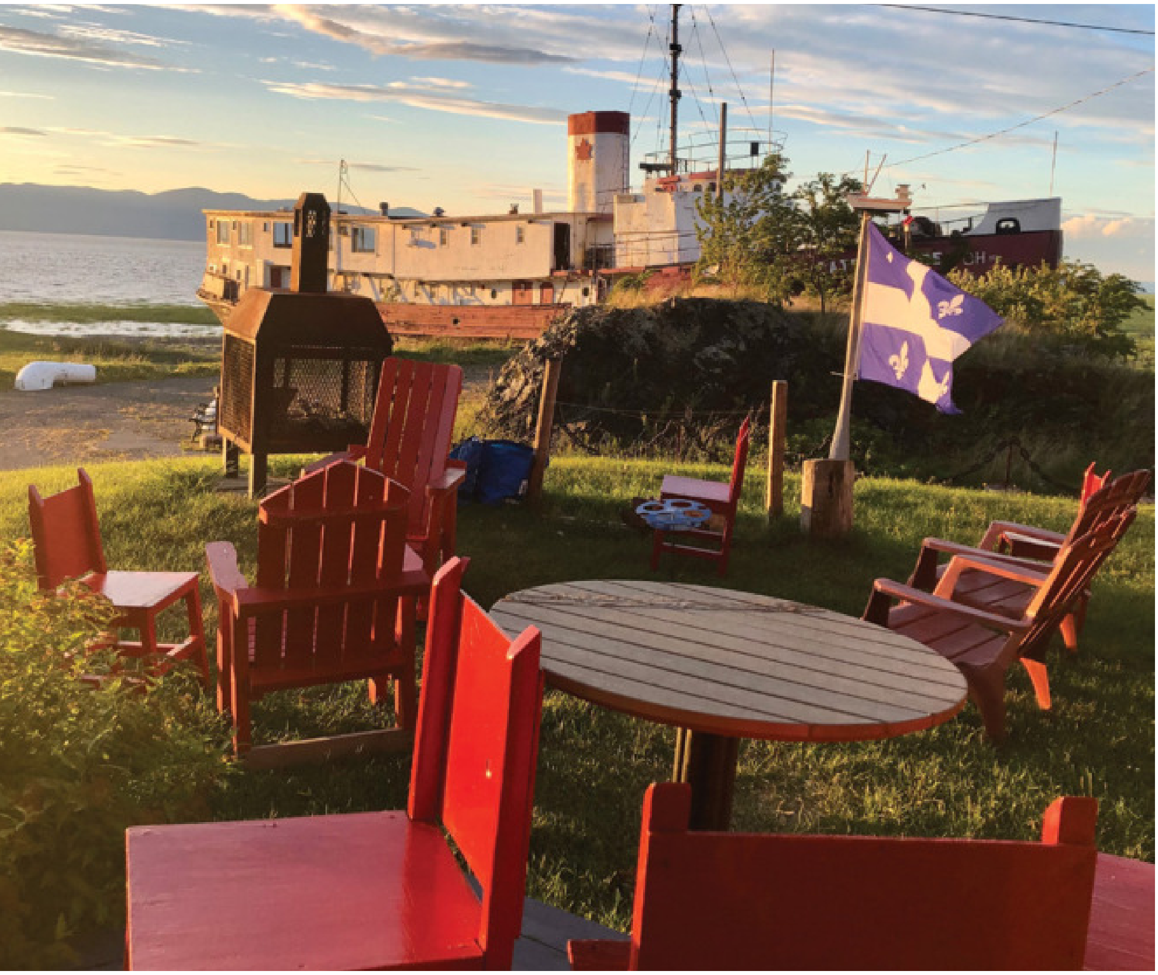
Unless, I thought, we both end up at the bottom together.

But Bill was keen to try for Isle-aux-Grues — his youngest son, Denzil, had sent him a birthday card a week before, which was now being held at the tiny post office on the island. The next day (breezy again), we set out. It was rough going. Bill skillfully piloted the boat around the north side of the island, but we saw no marina of any kind. Eventually we had to draw the boat up on shore, beside a towering hulk of a beached ship. The hull bore the name *Le Bateau Ivre* ("the Drunken Boat") along with a quote from the poem of the same name by Arthur Rimbaud:

Ô que ma quille éclate !
Ô que j'aille à la mer !
(Oh, let my keel shatter! Oh,
let me go to sea!")

Speaking of shattering keels, we nicked the propeller once again in reaching the landing spot.

As we found out later, the Drunken Boat is one of the *incontournables* (must-see sights) of Isle-aux-Grues. A storied vessel that took part in



the D-Day invasion, it served as a cruise ship in the 50s until it was run up on land, where its upper deck was converted into a restaurant. When the restaurant closed, it fell into disrepair and now sits with rusting and algaed sides, a few tree saplings growing on its decks.

Just beyond the Drunken Boat was a 200-year-old inn, Auberge Pourvoirie, where we had a much-needed hot breakfast and then set out to explore the island.

Isle-aux-Grues (the Island of Cranes) is known for its cheese, its birdlife and its connections to the painter Jean-Paul Riopelle. It is *not* known for its cranes (apparently a mistake of its early settlers, who confused the birds with herons). We walked an easy circuit around the western part of the island, past quaint historic houses with model lighthouses and ships in the yards, and eventually ended up at the post office.

"So *you're* Bill Barkley!" said the clerk. "We were calling all over to find out who you were. We thought you were a local."

Denzil's card was in rhyme, wishing his dad a happy birthday and a "creative, inspiring excursion:"

I hope the water is flat,
And the weather sunny
enough for a hat.

We'd certainly had a good amount of sun (my feet bore sandal-striped tan lines), though we were a bit lacking in the flat water department. But two mornings later, that changed. From the inn we looked out on a "gosling day," as they say in Prince Edward Island: a grey sea silked by the absence of wind, an unblemished continent of sky, and gulls floating and whirling like spice grains blown from the palm. Cordgrass and eelgrass stretched out over the flats like a green prairie. With the tide out, the waterline was 30 metres below the beached *Hepcat*, but with these calm conditions we couldn't wait. We gathered a few driftwood logs, put them under the boat and, with the help of some of the inn's guests, rolled it down to the water's edge.

I was nervous. We had to cross 14 kilometres of open water, and wind and fog could appear at any time. But

CLOCKWISE FROM LEFT: BILL BARKLEY; HEIKO WITTENBORN/BONJOUR QUEBEC;
BILL BARKLEY; GREGOIRE ALEXANDRE/BONJOUR QUEBEC; CLAUDE BOUCHARD/BONJOUR QUEBEC

Clockwise from FAR LEFT: Le Bateau Ivre ("the Drunken Boat"), one of the must-see sights on Isle-aux-Grues; a historic church on Île d'Orléans; waking up from a night on the boat in Baie-Saint-Paul; river views from Auberge Pourvoirie, Isle-aux-Grues; snow goose decoys for hunting, a popular activity on the island.

Bill set a compass reading, and we motored out past foam lines and into the grey expanse. The clarity of the morning had faded somewhat, and the sky was like hazed glass, with the faintest underwash of blue. I sat in the stern while Bill drove from midships; with the weight thus distributed, *Hepcat* rode the waves better. I studied the water for signs of whales and seals; Bill studied his compass; and we both glanced frequently at the navigational charts.

In the middle of the estuary, we felt we could have been in the middle of the ocean.

But we made it — and ended up at the very beautiful Baie-Saint-Paul, a sea town hemmed by mountains. With only a few days left in our adventure, we knew we'd never reach Tadoussac, 120 kilometres further along the north shore. We decided that the next day, we would return by bus and Uber to Portneuf, retrieve our vehicle and trailer, and retrace our route to collect *Hepcat*.

Baie-Saint-Paul had no accommodation available, and Bill ended up pitching his tent on the marina dock. I slept on the boat — one of the more uncomfortable nights I've spent in a long time. But I heard an owl and the cackle of snow geese and ducks; and with the night large and wakeful around me, I fell to workshopping my song lyrics:

We had to get used to the river's moods
To the waves' rough hands
To time that is pulsed by the moon's pull
To wind-stayed days on land.

People ask me if I'd do the journey again. Maybe in a real sea-going vessel, and with a whole summer at my disposal. The lack of a proper boat slowed us down and made us hyper-cautious. We didn't make it as far as we wanted, we never did get a chance to fish, and we saw no whales or seals. But we did get a taste of estuary life and learn something about tides, winds and patience. In other words, we learned to live on River Time (which ended up being the title of my song).

And of course, we ate lot of poutine. That deserves a song in itself. ❂

Get the full version of Jamieson's song River Time at cangeo.ca/rivertime

Help us tell CANADA'S STORY

AS AN AMBASSADOR of the Royal Canadian Geographical Society, I was welcomed by a community of naturalists and photographers, who became my circle of mentors. They helped me deepen my commitment to visual storytelling. They taught me to respect the stories of nature, to be caring and thoughtful when sharing stories, both from home and around the world.

I believe that Canadians must tell their own stories. That is why I care so deeply for *Canadian Geographic* and our community. In an increasingly complex world, Canada gives me hope.

JENNY WONG
RCGS Ambassador

Since 1930, ***Canadian Geographic*** has been a trusted source for journalism in Canada. As one of the few print and online magazines left, *we need your support.*

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ROYAL CANADIAN GEOGRAPHICAL SOCIETY

CANADIAN Geographic

FORMER PRIME MINISTER STEPHEN HARPER CALLS ON CANADIANS TO WAVE THE FLAG

Former Prime Minister Stephen Harper with the Pearson Pennant flag design.

On the same day that Stephen Harper joined four other living former Prime Ministers in urging Canadians to rally around our national flag in the face of threats and insults from U.S. President Donald Trump, he also took to the stage at the Royal Canadian Geographical Society to launch his new book, *Flags of Canada*.

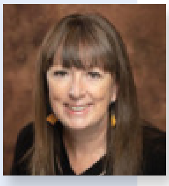
Since Trump re-assumed the office of President in January, he has implemented steep tariffs on Canadian goods and made troubling statements that appear intended to undermine Canadian sovereignty. During a question-and-answer period at the book launch, held at 50 Sussex on Feb. 11, Harper called on Canadians to embrace our shared history and identity and also suggested the country might need to take a temporary financial hit to ensure its survival.

"There's real risk here and I think there's real opportunity as well," he said. "I do think that if Trump were determined, he could do a lot of short-term economic damage, but I would accept that. I would accept any level of damage to preserve the independence of the country."

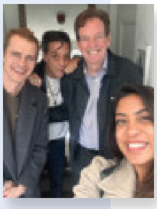
The timely *Flags of Canada* is a comprehensive look at the many symbols and banners that have emerged through four centuries of Canadian history, culminating in the iconic maple leaf that was adopted as our national flag 60 years ago. The question on everyone's minds at the launch was how well it holds up in the face of unprecedented aggression from our closest neighbour, ally and trading partner.

"I'm obviously biased, but having attended world events as Prime Minister and seen our flag in context, I think it holds up extremely well," said Harper, who spent about 45 minutes in conversation with RCGS CEO John Geiger before an audience of MPs, diplomats, parliamentary staff and Fellows. "It's unique, it's elegant, it has historical meaning, and with all deference to my fellow flag geek here, it's a better flag than the Pearson Pennant." ✻

SOCIETY BRIEFS



RCGS Fellow **Charlene Bearhead** has been appointed to the board of the National Council for Reconciliation. Bearhead's long career promoting reconciliation through education has benefitted countless organizations, including the Royal Canadian Geographical Society, where she currently serves as Vice-President of Learning and Reconciliation.



Congratulations to actor **Hayden Christensen** and television personality **George Stroumboulopoulos**, who became Honorary Fellows of the RCGS in February. The pair were recognized for bringing Canadian star power to the international stage.

RCGS CEO **John Geiger** celebrated Shackleton Day, February 15, at the Explorers Club in New York City, where he gave a presentation on the Society's 2024 discovery of the wreck of *Quest*. RCGS Fellow **Mensun Bound**, discoverer of *Endurance*, also made a presentation. Fellow **Geir Kløver**, director of the Fram Museum in Oslo, Norway, was in attendance. Geiger also returned EC flag 211, which was carried on the Society's expedition, to Explorers Club president Richard Garriott.

CLOCKWISE FROM TOP LEFT: LINDSAY RALPH/CAN GEO; COURTESY CHARLENE BEARHEAD; ALIYA JASMINE; MARC BRYAN-BROWN/EXPLORERS CLUB

FEATURED FELLOW: MENSUN BOUND

Mensun Bound served as director of exploration on the Endurance 22 expedition, which located Shackleton's famed ship in the Weddell Sea in 2022.

JULIEN TRINCALI

From sailing working ships at just nine years old to spending four decades excavating shipwrecks, it's no wonder Mensun Bound is known as the Indiana Jones of the Deep. In 2012, Bound turned a keen eye to Ernest Shackleton's *Endurance*. Lying more than 3,000 metres below the surface of the ice-filled Weddell Sea, *Endurance* was called "the world's most unreachable shipwreck." Yet in 2022, an international team led by Bound achieved the impossible and located the wreck. Here, Bound discusses the discovery, Shackleton's legacy and the future of *Endurance*.

On the start of the search

In August 2012, I'd just been asked if I could find *Terra Nova*. One day, I was leafing through that day's newspapers, and on page seven of the *Daily Telegraph*, there was an article with the headline "*Terra Nova* Found." I just could not believe it. I was devastated. I showed my friend the article. He scratched his head and went, "Well, what about *Endurance*?" I tried to talk him out of it; he just ignored me.

On the icy Weddell Sea

We went into the field in 2019, and it was a disaster, beginning to end. Everything that could have gone wrong went wrong. The ice constricted us like a boa constrictor, and we got stuck several times. One time in particular, we were worried we would end up on the wrong side of history, like *Endurance*. Three years later, we resumed the search, having learned from our mistakes and with new technology. But what we could not believe was: in just three years, the ice pack which had been there since the last ice age was virtually gone. It was brilliant news for us, but terrible news for the planet.

On Shackleton's legacy

Shackleton was a complex character, and we don't really know him that well. He edited his life as he went along, and his diaries tell you nothing. He was as flawed as any of us, but he was brave, incredibly determined and resilient, and he had this ability to pivot every time an obstacle came up. In this day and age, where we have environmental catastrophes coming at us down the track, we need Shackletons for the new era. If Shackleton was around today, I know he'd have been an environmentalist. We depend on this next generation of scientists as never before in human history.

On *Endurance* enduring

We did not want the smash-and-grab that happened to *Titanic* to happen to *Endurance*. We did it by the book: we did not touch, we filmed, we recorded, we studied, and we left. Now the wreck is protected under the Antarctic Treaty, and it's in the care of the UK Antarctic Heritage Trust. I know that someday, some person somewhere will sit down and conduct or write the final, definitive chapter on the *Endurance* story. But that person won't be me. Maybe one day they'll bring her up, but that is beyond my lifetime.

—Interview by Daria Maystruk

CAN Geo TALKS

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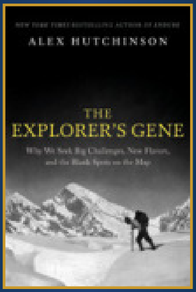

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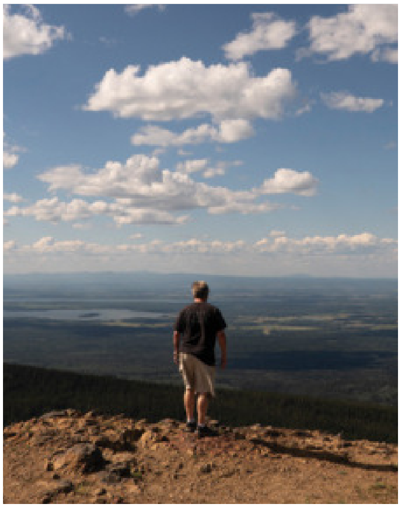
COMING UP

ELBOWS UP

As the U.S. president threatens to annex Canada, Canadian patriotism has reached a fever pitch. It's our very geography that the president is after: our abundant water, minerals, and oil and gas reserves. But it's that same geography that has shaped who we are. In an upcoming essay, Wade Davis unpacks who we are — and why our geography matters. Look for a special "Elbows Up" section in the next issue.

THE MAN ON THE HILL

In our technological age, the art and science of watching for wildfires from lookouts is fading away. But up on Sinkut Mountain, B.C., fire lookout Bart Vanderlinde watches on. Learn more about Vanderlinde in this photo essay by Paige Taylor White in the July/August issue.



STAY WILD

Bears, bison, bobcats — you name it, we've got it. In our annual Best Wildlife Photography 2025 special issue, Can Geo's Photo Club community will dazzle and transport you to the wild side. Find it on newsstands this fall.

THE GOOD SEED

The Anishinaabe followed manoomin, the good seed, wild rice, west to the Great Lakes more than a millennium ago, securing sustenance for future generations. But as the waters warm, how are the Anishinaabe maintaining food sovereignty and traditional practices — and adapting them for a changing world? Photojournalist Shelby Lisk invest-igates in the September/October issue.

Subscribe or renew today at canadiangeographic.ca/subscribe or by calling 1-800-267-0824. The July/August 2025 issue hits newsstands on June 16.

CLOCKWISE FROM TOP LEFT: KEELEIGH/ISTOCK; PAIGE TAYLOR WHITE; SHELBY LISK; LISA ADLER/CAN GEO PHOTO CLUB

CLOCKWISE FROM TOP LEFT: ISTOCK; KARI STUART-SMITH

HOW THE FOREST SECTOR CONSERVES BIODIVERSITY IN OUR FORESTS

Canada's forests are changing — fast. Hotter summers and drier winters, coupled with decades of fire suppression, have created conditions for wildfires to rage out of control, with cascading effects throughout the forest ecosystem.

Active management by the forest industry can help make forests more resilient to its effects and maintain critical habitat for wildlife. Human intervention in natural forest processes might seem counterintuitive, says Kari Stuart-Smith, manager of biodiversity and wildlife for Canfor, but "some areas actually need active management to restore their value to wildlife."

As an example, she points to the Rocky Mountain Trench south of Invermere, B.C. Historically, the southern portion of this broad valley would have been home to open stands of large-diameter Douglas fir, western larch and ponderosa pine, but after a century and a half of cultural and wildfire suppression, historical logging and forest ingrowth, these stands are now dominated by dense, small Douglas fir trees, with minimal grass and shrubs for animals to feed on. "We've been going in and removing sub-canopy trees and retaining the mature, overstory trees. Ideally, this is followed by prescribed burning, which the First Nations are now starting to do again." Together, these treatments reduce ladder fuels and the risk of severe wildfire behaviour, while also enhancing habitat for many species of wildlife.

Canfor's work is already having an impact; Stuart-Smith points to the resurgence of threatened Lewis' woodpeckers in one restored B.C. stand. Ten years ago, the large bird was nowhere to be found in the area. "After we opened it up, taking care to retain the standing dead trees that these birds prefer to nest in, there are now 15 pairs of these birds nesting in that stand."

Stuart-Smith acknowledges that forestry is often viewed as being at odds with biodiversity conservation, but says it's "absolutely possible" to have a healthy forest industry and a healthy environment. "It takes some careful thinking and adaptive planning."

Alice Palmer, an independent forestry industry consultant, agrees.

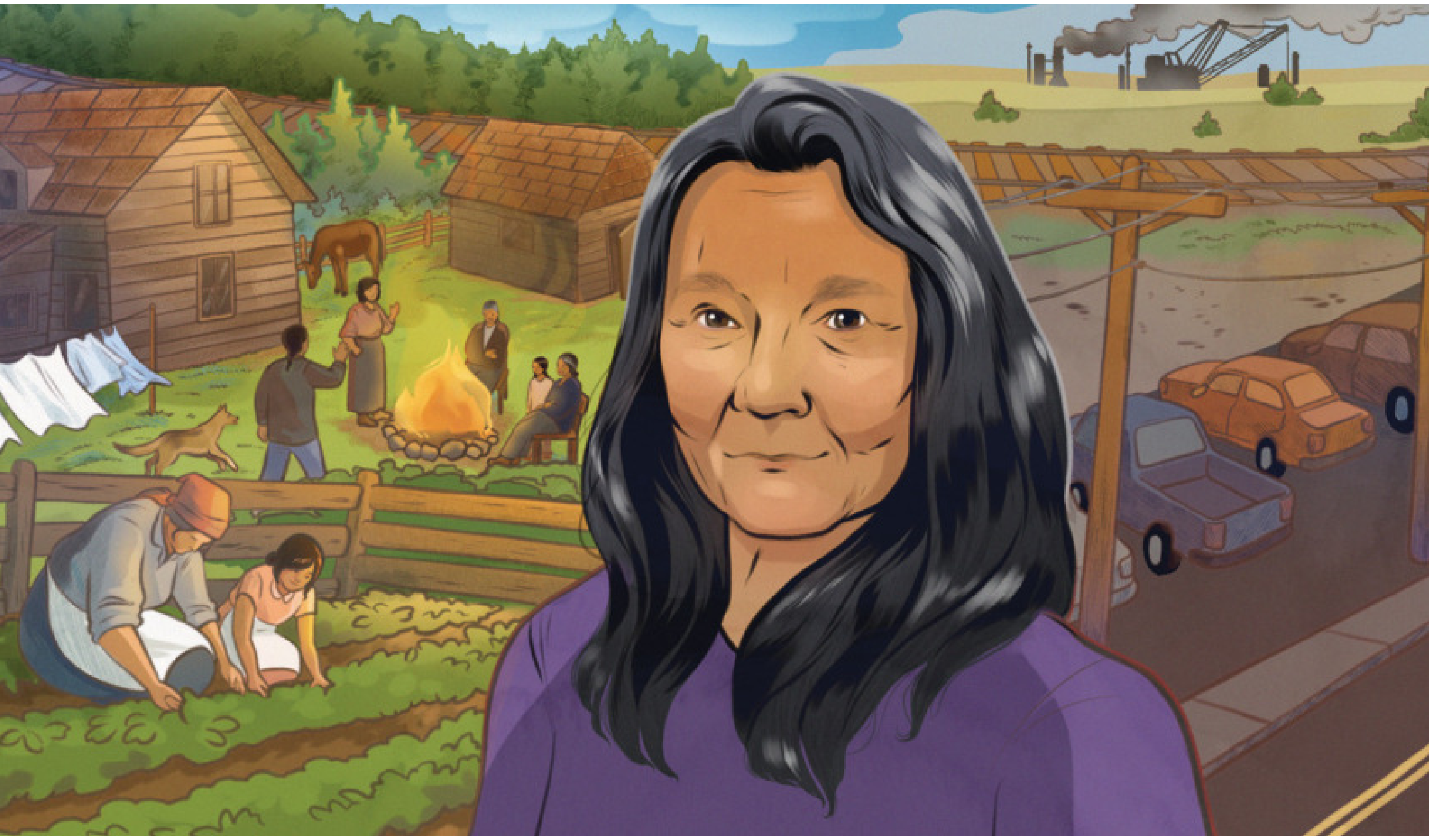
Forest management companies in Canada must develop annual or multi-year operating stewardship plans that then need to be approved by provincial governments. These plans, some of which include 5-, 25-, and 100-year horizon forecasts, also have to comply with dozens of acts and regulations.

"You have to look after the fish, the wildlife, tree species, slopes, soil ... even how you build roads to do the work," says Palmer.

All forests harvested on public land — accounting for about 90 per cent of Canada's forests — are required by law to be regenerated. As a result, since 1990, less than 0.5 per cent of Canada's forests have been lost to deforestation, which is the permanent conversion of forest to non-forest. All stands are reestablished with ecologically appropriate species grown from locally-sourced seed, but increasingly, the sector is exploring the use of seeds that are better adapted to warmer temperatures, such as seeds from slightly further south. This will help forests adapt to future climate conditions.

"Forests change over time — they're masters of renewal," says Palmer. "But it takes a long time, beyond a time scale that we can really see as human beings." That's why it's important to maintain a long-term view and vision for our forests.

To learn more about how Canada's forest sector can support a more sustainable future, visit forestryforthefuture.ca.



Tantoo Cardinal

The Cree and Métis actress on coming to terms with the transformation of her hometown

I was born in Fort McMurray, Alta., and grew up in the nearby community of Anzac. Whenever you saw anybody on the road, you always said hello. We shared moose meat, grew gardens and fished. We'd laugh and tell stories and cherish our musicians, dancers and jiggers. A railroad through the community was our line to the outside world.

It was also a time when companies came to Fort McMurray for oil and gas exploration. Today, the city is known as the heart of the tar sands, but I remember it quite differently. I left when I was 15 to attend high school. When I returned 15 years later with my son, on the same train I left on, the world I once knew no longer existed.

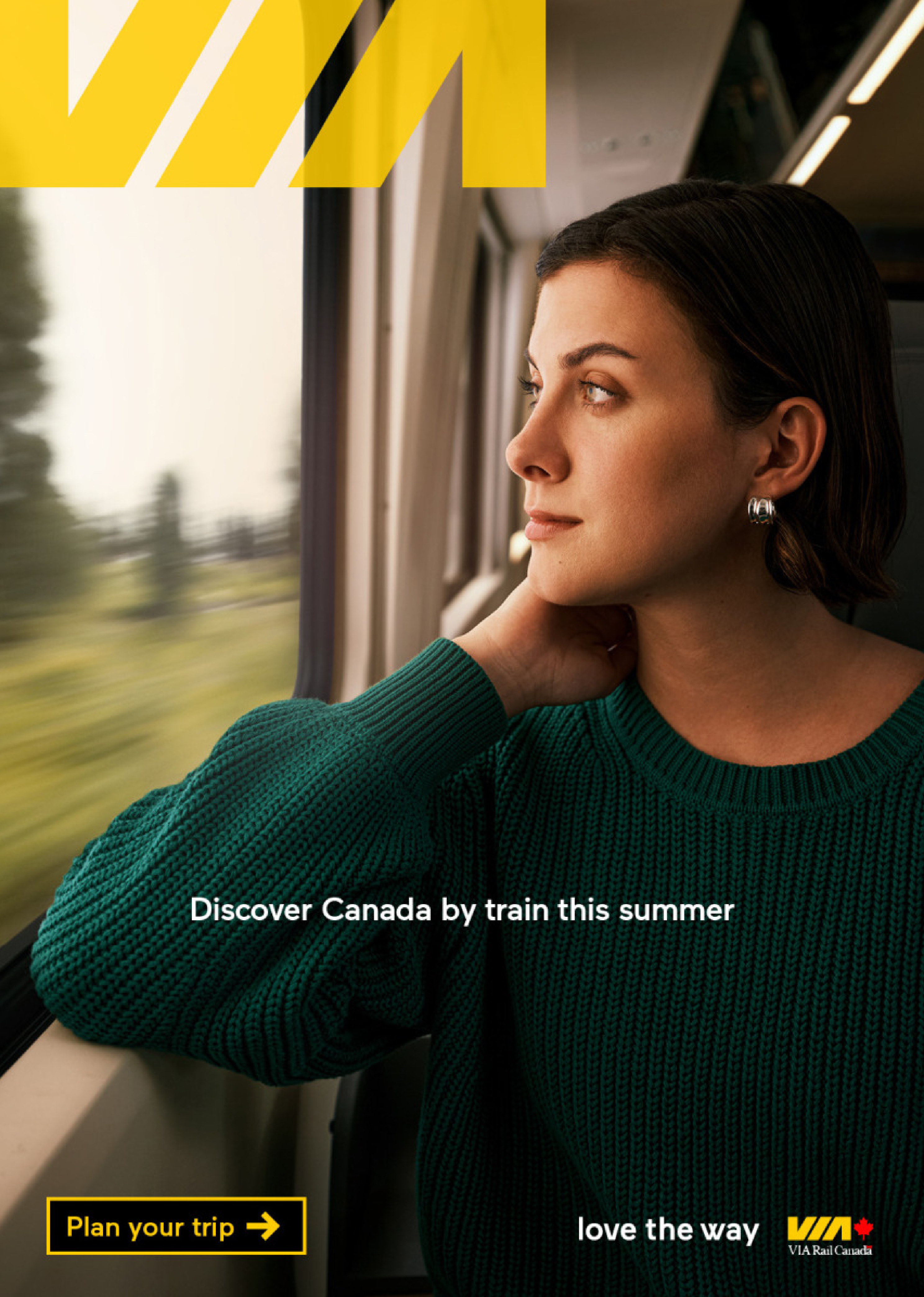
There were now roads and lines and wells everywhere. Houses had disappeared, replaced with muddy parking lots. The animals we used to live off of tasted different. Everything was nearly unrecognizable, save for a few trees that still had carvings I'd etched into them years before. I felt a sense of displacement.

I still long for the beauty that once was, but I have developed a new relationship with the Earth. Wherever I go is a place I belong — whether it's the badlands, mountains or boreal forest, I accept it's part of the world and the creation we're in. Mining is depleting this living organism we're part of, and it's impacting us all, from the air we breathe to the water that surrounds us. Everything is connected; the oceans are the womb of Mother Earth. Everywhere we are is part of everywhere else.

—as told to Samantha Pope

NATASHA DONOVAN

Fort McMurray is on Treaty 8 territory, the traditional lands of the Cree and Dene Peoples and part of the Métis homelands.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POLAR EXPLORER

COME WIND, HAIL OR TEMPESTS

Its name says it all. The Explorer was inspired by those who first summited the Earth's highest peaks. Like them, it is able to endure these most strenuous conditions. However sober and smart this watch may be, it is precisely the tool these adventurers need. Amidst the chaos of the unknown, what these men and women require is reliability and above all, simplicity. Something reassuring, efficient and instantly legible, to ground them even if nothing else around or within them does. This watch embodies just that. An unremitting teller of time, come wind, hail or tempests, that will see one's own adventure to its pinnacle. The Explorer.

OYSTER PERPETUAL EXPLORER

ROLEX